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AUGUST, 1955

METAL FINISHING

DEVOTED EXCLUSIVELY TO METALLIC SURFACE TREATMENTS

FOUNDED 1903

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**Finishing Exposition and Convention
Held in Cleveland**

Notes of Interest on Activities Held

**Great Flexibility a Feature of New
Automatic Plater**

*Details of One of the Largest Installations
in the East*

**Report of the Annual Conference of the
Institute of Metal Finishing**

Abstracts of Recently Presented Papers

**Electrodeposition of Nickel from
Fluoborate Solutions**

*Investigation of Suitable Solutions and
Optimum Operating Conditions*

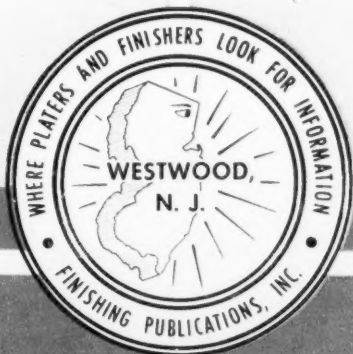
Electroless Nickel Deposition

*Application of Electroless Nickel to
Non-Conductors*

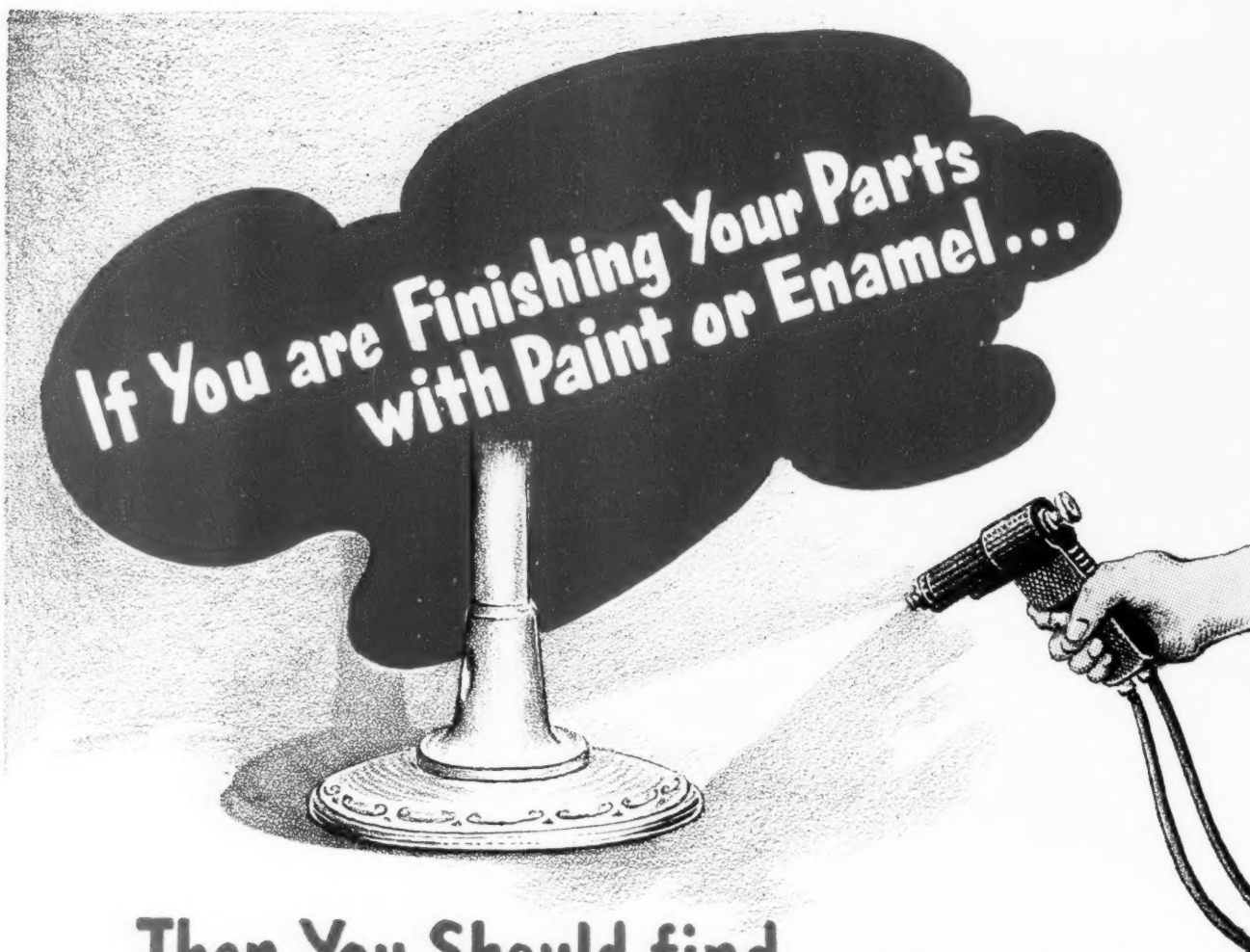
Science for Electroplaters

Valency

Complete Contents Page 39



READ & PASS ON



Then You Should find

Some of these products of great help to you in your production work. These materials have been developed to increase your efficiency and all have been in regular production work for years.

We suggest for your consideration . . .

For Conversion coatings on steel	CLEPO-PHOS-196-F.
For Waterfall Spray booth cleaning	CLEPO-58-E.
For Stripping paint and enamel from steel	CLEPO-5-R.
For Soak cleaning of steel, zinc base, etc.	CLEPO-136-R.
For spray washing machine cleaning . . .	

CLEPO-126 a heavy duty cleaner for steel.

CLEPO-131-W a milder cleaner for Brass, steel, etc.

CLEPO-85-AN a mild but powerful cleaner for all metals.

Your Clepo Service man will be glad to demonstrate these materials at your convenience.

FREDERICK

GUMM

Chemical Company Inc.

538 FOREST STREET, KEARNY, N. J.



FROM THOUSANDS of TESTS come the solutions to your metal finishing problems.

If you are looking for creative chemistry to supply new methods for the improvement of metal finishing, look to the leader — ENTHONE. Write for the answers to these problems, identifying them by number. If your specific problem is not listed, Enthone will gladly help to find the answer.

1. HOW TO BLACKEN copper, brass, zinc, steel and other metals to meet U.S. Government specifications.
2. HOW TO STRIP NICKEL from steel without etching the steel.
3. HOW TO STRIP NICKEL from copper and brass without attacking the part.
4. HOW TO SHED WATER from metals to prevent staining or spotting during drying.
5. HOW TO TRAP FUMES from hot sulfuric acid pickles.
6. HOW TO STRIP SYNTHETIC ENAMELS from aluminum and other metals without attacking the metal.
7. HOW TO CLEAN AND REMOVE RUST AND OXIDES from steel in one operation without acids.
8. HOW TO RINSE AND DRY STEEL WITHOUT RUSTING, using cold or hot water.
9. HOW TO SHORTEN ALKALI CLEANING TIME for steel to 15 seconds.
10. HOW TO REMOVE SOLID DIRT AND OIL from metals.
11. HOW TO STRIP LEAD, TIN or soft solder from copper and brass with no etching.
12. HOW TO PLATE METALS upon aluminum.
13. HOW TO REMOVE EXCESS SILVER SOLDER chemically from silver brazed steel parts.
14. HOW TO MAKE PAINT STICK to brass and zinc.
15. HOW TO SOLVENT-CLEAN parts and assemblies with cold non-hazardous solvent.
16. HOW TO OVERCOME CHROMIC ACID CONTAMINATION in cleaners.
17. HOW TO PREVENT STAINING of chromium plate.
18. HOW TO GIVE ZINC AND CADMIUM high salt spray resistance.
19. HOW TO COLOR ALUMINUM in one operation.
20. HOW TO STRIP METAL COATINGS from zinc die castings.

** The Scientific Solution of Metal Finishing Problems.*

ENTHONE
INCORPORATED

METAL FINISHING PROCESSES
 442 ELM STREET, NEW HAVEN 11, CONNECTICUT
 ELECTROPLATING CHEMICALS

Service Representatives and Stock Points in Principal Cities of U.S.A. and Canada, Mexico, Brazil, England, France, Sweden and Germany.

Are you looking for better methods for stripping paint?

What's the best way
to strip metal parts in large volume?
See page 9



Do certain finishes resist your present stripping methods? Do rejects pile up and cause a bottleneck in your production line? Do you have trouble stripping vertical surfaces of large products?

Oakite's FREE booklet on "How to STRIP PAINT" will help you find more efficient procedures. You'll want to read more about:

- What's the best way to strip paint from metal parts too large to be soaked in tanks? *See page 3.*
- What's the best way to strip large areas of structural metal where a steam supply is available? *See page 5.* Where steam is not available? *See page 7.*
- What are the best ways to prepare stripped metal for repainting? *See page 11.*
- What strippers are best for removing oil-base paints? ... Synthetic enamels, alkali-resistant plastics or resin-based paints? ... Japans, wrinkle finishes, nitrocellulose lacquers, alkyds, phenolics and ureas? *See page 12.*

Oakite has more than a dozen fine stripping materials including:

1. Alkaline strippers that remove many types of paint and are also excellent for "killing" the overspray in water-wash paint booths.
2. Solvent strippers that work well on the newer types of synthetic lacquers.
3. A viscous solvent stripper of special value because it adheres to vertical and inverted surfaces like the sides of tanks, shelves of cabinets, etc.
4. An acidic material that strips certain organic finishes and simultaneously removes oil and rust.

FREE
for your copy of
"How to STRIP PAINT"
just write or
mail the coupon.



OAKITE PRODUCTS, INC., 18 Rector St., New York 6, N. Y.

Send me a FREE copy of your booklet **"How to STRIP PAINT."**

Name

Company

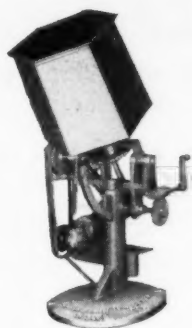
Address

At the Production Engineering Show Visit Oakite Booth No. 652

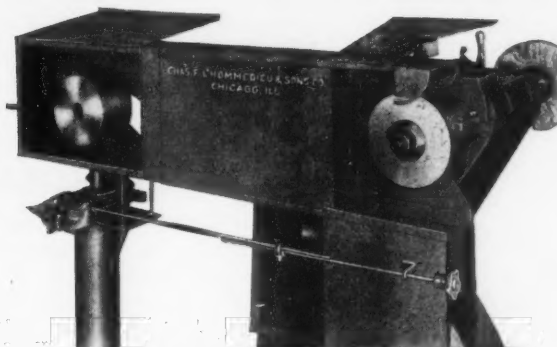
USE "RELIANCE" PRODUCTS FOR

ECONOMY : EFFICIENCY : DEPENDABILITY

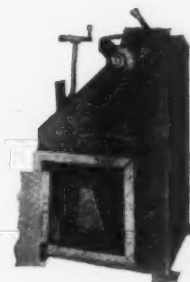
WRITE FOR FURTHER DETAILS



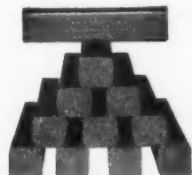
**OBLIQUE
TUMBLING BARREL**



BACKSTAND IDLER WITH LATHE



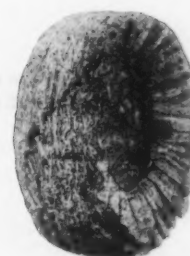
**#23A
POLISHING LATHE**



**EXTRUDED COMPOSITIONS
STANDARD SIZE
2 x 2 x 10"**



BACKSTAND IDLER



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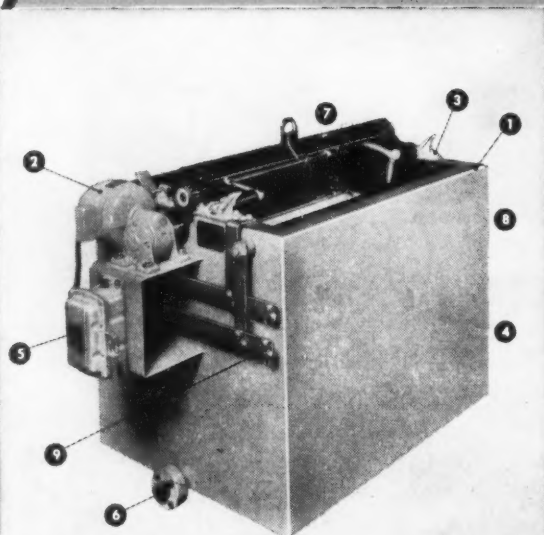
CHICAGO



Branches:
Cleveland
and
Los Angeles

this improved **H-VW-M** **MERCIL-TYPE PLATING TANK** with **SUBMERGED CYLINDER**

*plates faster
 reduces maintenance cost
 permits larger loads*

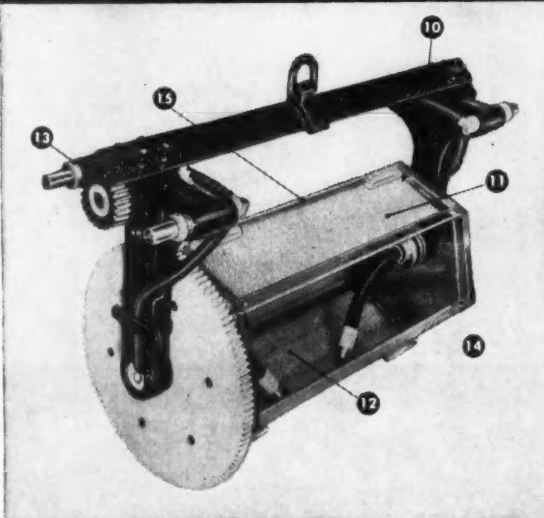


by combining all these features for better barrel plating:

- 1 **TURNED-IN FLANGES**—save space, provide enclosure for hanging heating and cooling coils.
- 2 **RELOCATED, MORE COMPACT MOTOR DRIVE**—drive shaft *now* above solution level, preventing leakage through shaft openings in tank walls.
- 3 **REDESIGNED SADDLES**—make barrel positioning far easier.
- 4 **NO OVERFLOW TROUGH**—not essential with this improved design, saves space inside tank.
- 5 **PUSH-BUTTON TYPE MOTOR STARTER**
- 6 **BOTTOM DRAIN**
- 7 **COIL RISERS**—extending over top of tank.
- 8 **ANODE RODS**—2 for each cylinder on both single and multiple units.
- 9 **BUS BARS**—positive and negative on *each* end of tank for equal current distribution.

These *improved* tanks are constructed of $\frac{1}{4}$ " double-welded steel plate in 2 sizes, 14" x 30" I. D. (224 gal.) and 14" x 36" I. D. (252 gal.). For acid solutions, tanks are lined with $\frac{1}{8}$ " vulcanized rubber or plasticized PVC. For cyanide solutions, rough-wire glass is used in back of anodes. Finish is rust-resistant grey enamel with black trim.

TOGETHER, They form the Ideal Combination for Better Barrel Plating!



- 10 **IMPROVED HANGER ASSEMBLY**—now made of rigid angle-iron, improved to insure proper barrel alignment.
- 11 **ONE-PIECE PANELS**—Plexiglas: $\frac{1}{2}$ " thick, no ribs. Melamine: $\frac{1}{4}$ " thick, ribbed.
- 12 **CONVEX TUMBLING SURFACES (Plexiglas only)**—for added strength, easier tumbling action.
- 13 **MELAMINE BUSHINGS**—for insulating bronze hanger pins.
- 14 **EASY LOADING & UNLOADING**—cover with handle in panel area is easily reached at all times.
- 15 **SECURE BONDING**—all molded parts firmly bonded with cement and monel screws.

These *improved* cylinders are available in either Plexiglas, for temp. to 180°F., or Melamine, for temp. of 200-210°F. (Melamine has excellent resistance to abrasion). Hexagonal in shape, with 1" thick heads and special convex (Plexiglas only) one-piece panels, they are designed for greatly reduced maintenance cost and engineered for use *completely submerged*... with outstanding results: more consistent plating, 20% higher load capacities, 25% faster plating. And, in zinc baths, total submersion minimizes chance of spark igniting gas above bath.



Your H-VW-M combination—of the most modern testing and development laboratory—of over 80 years experience in every phase of plating and polishing—of a complete equipment, process and supply line for every need.

For complete information on improved H-VW-M Mercil-Type Tanks and Cylinders ask for Bulletin PB 109.

HANSON-VAN WINKLE-MUNNING CO. • MATAWAN, N. J.

Plants: Matawan, N. J. • Grand Rapids, Mich.

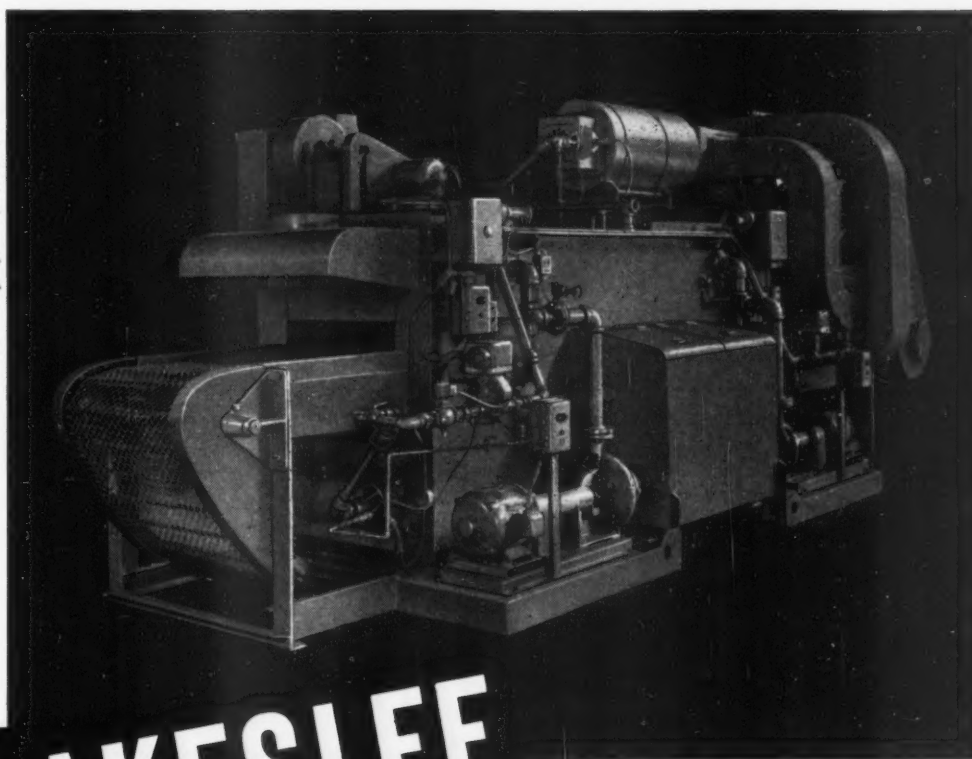
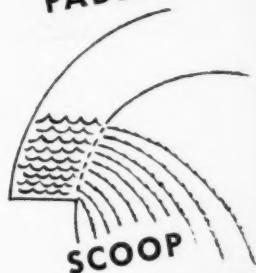
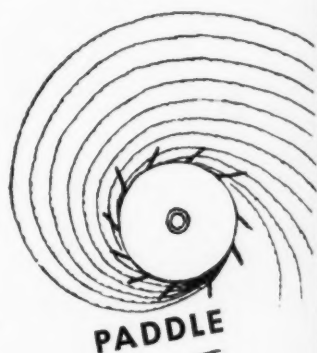
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INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING AND POLISHING PROCESSES • EQUIPMENT • SUPPLIES

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RUGGEDNESS
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Stampings and other metal parts take plating or painting with fewer rejects, and lower batch and unit costs, when first cleaned with Dow Sodium Orthosilicate.

Dow Sodium Orthosilicate

cleaning compound does a
better job on metals
and cuts costs twice—
in cleaning and finishing

Your metal finishing plating or painting results—and costs—are controlled by the efficiency of your cleaning operation. When Dow Sodium Orthosilicate cleaning compound is used in your dip, soak or electrolytic process, there are fewer rejects at *either* point—cleaning *or* finishing.

Oils, fats and waxes readily emulsify through this heavy-duty cleaner's action. There's no redeposition—insoluble materials *stay* suspended. Dow Sodium Orthosilicate's high acid capacity and high pH gives a consistently effective cleaning with every run. Clean, bare parts are ready for reject-free finishing after a quick rinse.

Savings are increased if your cleaning is electrolytic—solutions of Dow Sodium Orthosilicate have a very high electrical conductivity, permitting any current density *without* excessive voltage.

To get more information about cost-cutting Dow Sodium Orthosilicate metal cleaner—write today to THE DOW CHEMICAL COMPANY, Dept. AL 909K, Midland, Michigan.

you can depend on DOW CHEMICALS

DOW



Thank You!
**CALL
AGAIN**

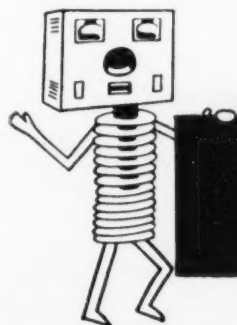
You see these words in just about every store you go into. They express what the owner feels—gratitude for your visit, and the hope you'll visit him again.

These words just about sum up the way we feel about the many plating friends who stopped by our Booth at the 4th Industrial Finishing Exposition in Cleveland. We thank them for coming to see us, and hope to see them again — soon.

At our Booth, we displayed:

- Our New Germanium Rectifier—"The Power Supply of Tomorrow —Here Today!"
- Rapid Selenium Rectifiers — Automatic programming, voltage sensing & bench models.
- Rapid Quality Components — The "hearts" of our units.

Miss the show? We'll be glad to send you descriptive literature on any or all of our products. Just write to Rapid Electric Company, 2881 Middletown Road, New York 61, N. Y.



THE NAME THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY



News about COATINGS for METALS

Metallic Organic Decorative Protective

Copper plating process adapts to various needs

Better finishing results from matched plating processes

The first matched set of plating processes for a copper-nickel-chromium plate now exists to help platers reduce finishing expense in several ways.

(1) Three integrated Unichrome process work unusually well together, each deposit contributing to an outstanding finish. (2) Platers have just one call to make for prompt technical help if they should encounter operating trouble. (3) Work-improving and money-saving benefits are realized from the individual processes. For example:

IMPROVED NICKEL

Deposits from Unichrome Bright Nickel prove unusually receptive to the subsequent chromium. Having low internal stress, the deposits resist cracking and give excellent corrosion protection to the base metal. The remarkably stable solution has also reduced addition agent consumption, minimized operating problems.

MORE EFFICIENT CHROMIUM

Wider bright plating range and higher efficiency of Unichrome SRHS Chromium Solutions deliver many benefits. Plating time is often cut more than half, capacity of existing equipment goes up, more intricate parts can be successfully covered, and users often report finishes with better "color."

Contact the nearest office of United Chromium for details.

UNITED CHROMIUM DIVISION

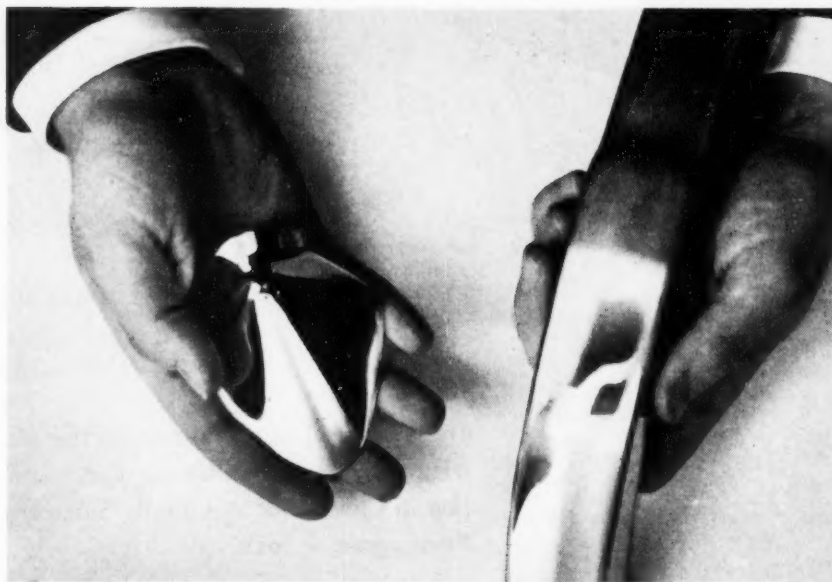
METAL & THERMIT CORPORATION

100 East 42nd Street, New York 17, N. Y.
Waterbury 20, Conn. • Detroit 20, Mich.
Chicago 4, Ill. • Los Angeles 13, Calif.

In Canada:

United Chromium Limited, Toronto 1, Ont.

Non-cyanide Unichrome Pyrophosphate Copper Process provides deposits of unusual nature—users benefit



Two of the finishes obtainable with Unichrome Copper. Left: Lustrous plate that needs no buffing prior to bright nickel (Courtesy Royal Plating and Polishing Co., Inc., Newark, N. J.). Right: Satin deposit (upper portion of steel part) that buffs fast and easy to a high color (shown on lower portion of part).

The Unichrome Pyrophosphate Copper Process can be controlled to suit a number of production needs exactly. Newly perfected addition agents, when added to the basic bath, alter the deposit without detracting from its time-proved features.

TO BUFF OR NOT TO BUFF

With one agent, a lustrous deposit is produced which can eliminate buffing. With another, a satin finish is produced which is ideal for buffing—permitting buffing of the free-flowing, ductile copper rather than base metal or subsequent nickel plate.

SMOOTHNESS IS BASIC

Whether used with or without the addition agents, Unichrome Copper deposits are noted for their essential smoothness. In addition, the plating bath has good leveling ac-

tion, and produces unusually fine grained deposits.

EXTRA BONUS

The Unichrome Pyrophosphate Copper solution contains no cyanide. Its use therefore minimizes the cyanide disposal problem of the plant. As one user recently put it, "a pyrophosphate-type copper solution was selected because of its wide brightness range and because it does not present a serious waste disposal problem."

COMPATIBLE DEPOSITS

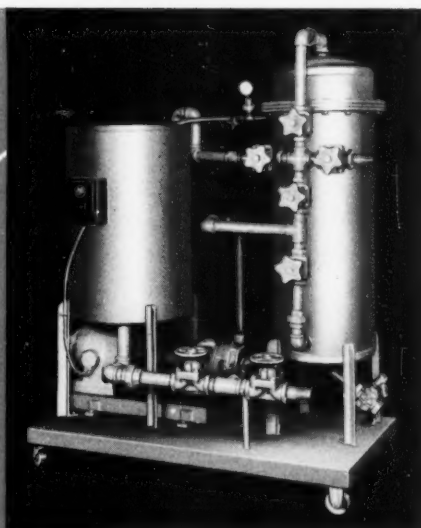
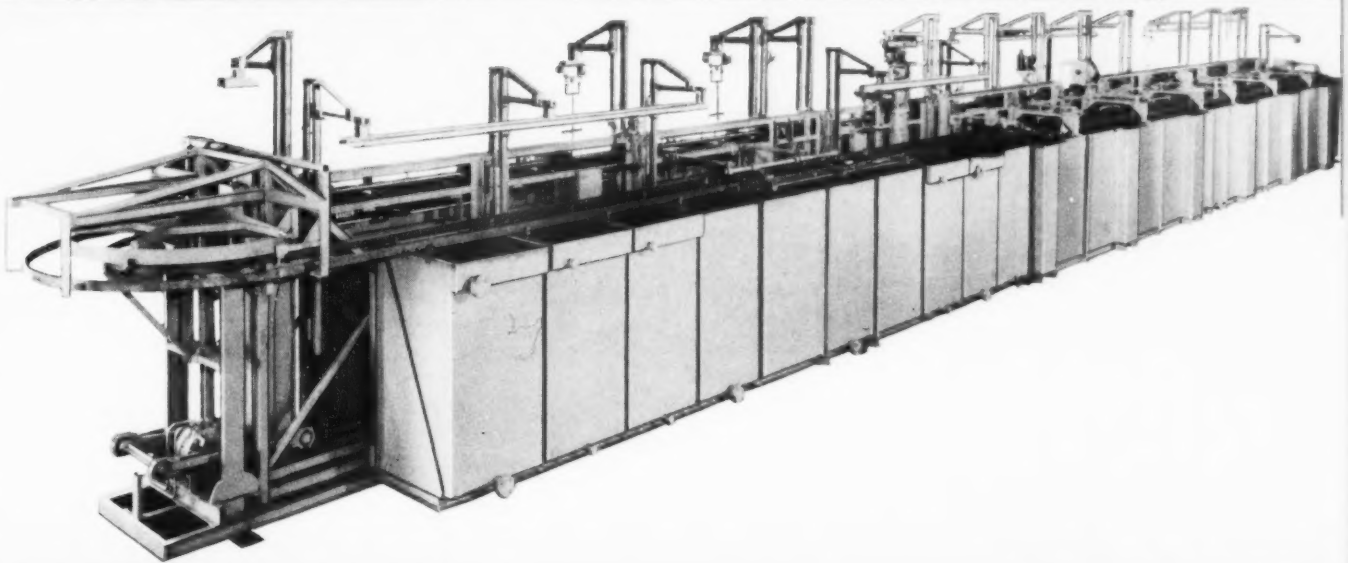
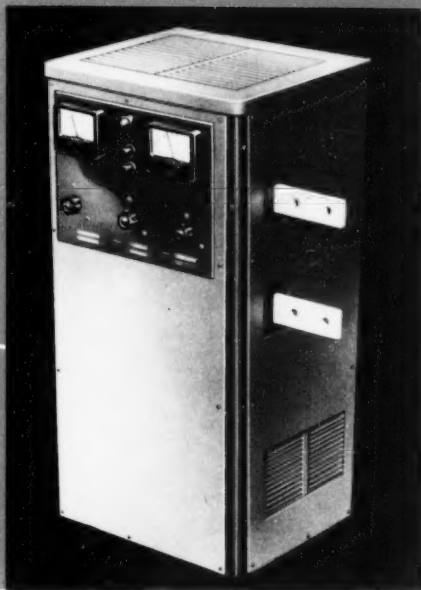
Unichrome Copper contributes also to better and more economical copper-nickel-chromium finishing. Its deposit proves ideally receptive for nickel plating, avoiding passivity problems and need for activation treatments.

Send for detailed information.

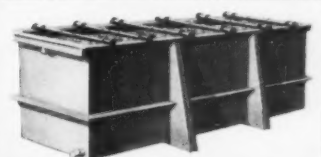
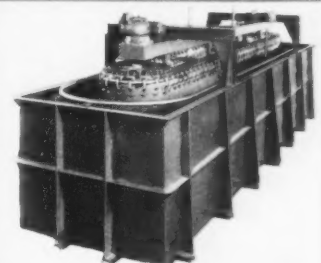
tomorrow's equipment today

WAGNER BROTHERS

automatic plating
equipment and supplies



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FILTERS
TANKS & LININGS
ANODES
WASTE TREATMENT SYSTEMS

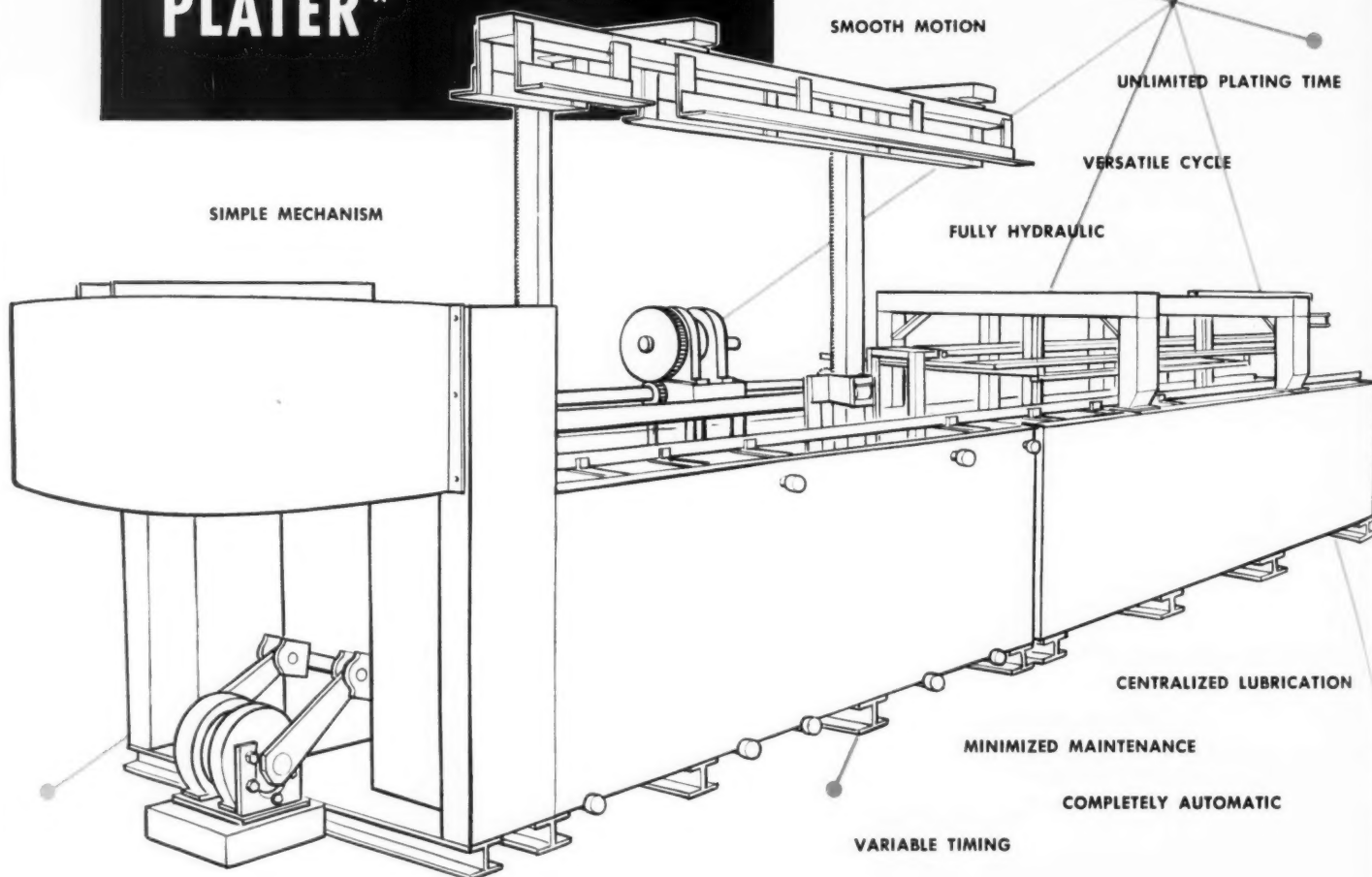


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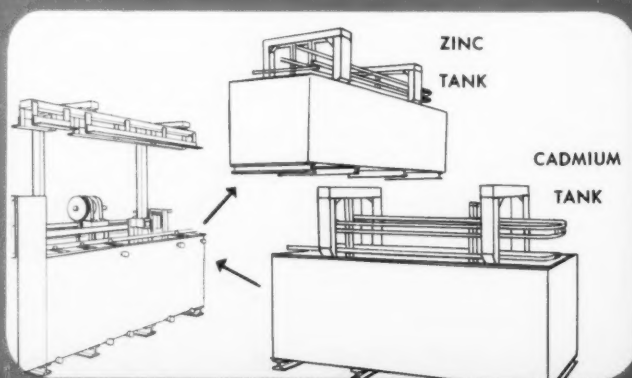
WAGNER BROTHERS NEW STANDARD FULLY AUTOMATIC PLATER*

revolutionary concept in
plating automation now
available to job platers
in a standardized model



Automatic operation benefits you by increased production capacity, lowered unit cost and improved quality control—it's faster, cheaper, better.

The new Wagner Brothers Standard Automatic now offers you, for the first time, an automatic plater with these exclusive advantages:

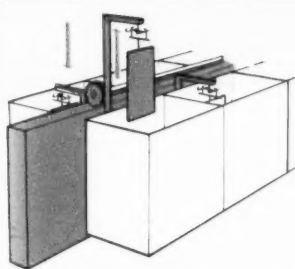
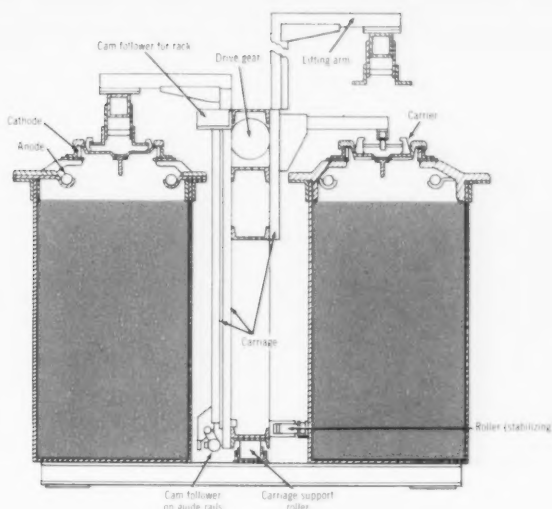


REPLACEABLE PLATING TANK

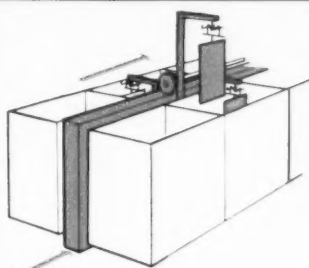
You can change from plating zinc to cadmium in minutes; the usual time-consuming tank cleaning operations are unnecessary. Just imagine what you'll save in time and materials. Since all conveying rails are built into the plating tank, you simply pull one tank aside and replace it with a spare. This feature gives you all the versatility of having two automatics.

AMPLE TRANSFER MECHANISM

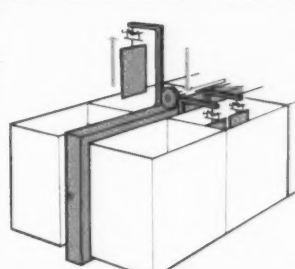
Unique vertical transfer and return type work conveying design efficiently minimizes number of parts, subsequently reduces chances of breakdown. There are no elevating superstructures, transfer cams, chains and sprockets or hydraulic cylinders over tanks. The carriage is motivated by a hydromotor mounted at the base of the machine, fitted with a crank and link to translate the simple harmonic motion of the motor shaft to the in-line reciprocating action of the carriage.



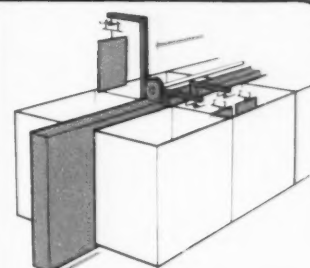
1st VERTICAL MOTION



1st HORIZONTAL MOTION



2nd VERTICAL MOTION



2nd HORIZONTAL MOTION

HOW IT OPERATES — All transfer and conveying mechanism is mounted on a reciprocating carriage located between the two rows of tanks. Two basic motions are used: one forward and reverse horizontal motion of the carriage and a raising and lowering movement of lifting arms attached to the carriage. Plating racks are attached to work carriers at the loading station. When the machine is started, the lifting arms pick up work carriers on one side of the machine, carry them forward to the next station where they are lowered and disengaged. This sequence is simultaneously produced in reverse on the opposite side so that the effect is a balanced work load which requires only low hydraulic pressures.

ELECTRICALLY ISOLATED — The plating tank is a separate unit, electrically isolated from the rest of the mechanism to eliminate possibility of stray currents.

3 POINT CONTACT — The work carrier is designed to give 3 point contact at all times. Constant wiping action on electrified rails keeps contacts clean, assures constant, dependable current flow.

VERSATILE CYCLE — You can have as many as seven stations in both the pre- and post-plating cycle. Tanks are sectionalized at the factory to your particular needs.

SMOOTH PARTS TRANSFER — Our hydromotor power principle *eases* parts through their cycle without jarring them loose from carriers into the tanks.

MINIMIZED MAINTENANCE — All these features vastly minimize maintenance needs: fewer moving parts to wear, no vibration or backlash in automation, no hydraulic cylinders over tanks to contaminate solutions, centralized lubrication, built-in overload protection, working parts easily reached without disassembly, uses only low hydraulic pressures because of balanced work load, and many more.

SIMPLE INSTALLATION — Unit is delivered to your plant intact or in two completely assembled sections. You avoid costly installation.

WRITE NOW FOR COMPLETE TECHNICAL DESCRIPTION, QUOTATION

WAGNER
BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.

FACTS YOU SHOULD KNOW ABOUT SELENIUM RECTIFIERS

Don't be misled by extravagant claims and technical gibberish about stack rectification areas—

HERE ARE THE FACTS

CIRCUIT	STACK RECTIFYING AREA WAGNER BROTHERS	STACK RECTIFYING AREA OTHER MAKES
3 Phase Half Wave	5.4 sq. in./amp.	3.2-4.5 sq. in./amp.
3 Phase Full Wave (6 Phase)	5.4 sq. in./amp.	3.2-4.5 sq. in./amp. 3-3.7 sq. in./amp. and I.P.T.*
3 Phase Bridge Circuit	8.4 sq. in./amp.	6.0-6.5 sq. in./amp.

*Inter Phase Transformer

On a directly comparative basis, Wagner Brothers Selenium Rectifiers have up to 40% more rectification area than most competitive selenium rectifiers now on the market—up to 8.4 sq. in./ampere compared with a maximum of 6.5 sq. in./ampere found in competitive models.

WHY MORE RECTIFICATION AREA? — Ample stack area insures higher rectifier efficiency, longer stack life (reduces chances of burn-out), lower temperature rise and ample capacity for overloads.

SUPERIOR STACK CONSTRUCTION — Rectifier cells are selected with the best of electrical characteristics, being made with double collector type assembly to guard against paint between collector contact and the cell which might form either an open circuit or high resistance at the contact. Stacks contain solder type terminals to the bus bar to eliminate possibility of loosening bus bar after hot and cold cycle operation.

LOWER TEMPERATURE RISE — The life of a selenium cell is dependent upon the temperature at which it is operated. The maximum safe operating temperature is approximately 70° C. (158° F.). Wagner Brothers Rectifiers operate with an average temperature rise of only 15° F., thus, in an ambient temperature of 100° F., the temperature will not exceed 115° F.

ADEQUATE OVERLOAD FACTOR — Our tests indicate that the maximum safe operating temperature is not reached until our rectifiers are overloaded to 500% of normal rating. Even in the event of a fan or cooling failure, adequate stack area permits operation of the rectifier without exceeding the maximum safe operating temperature.

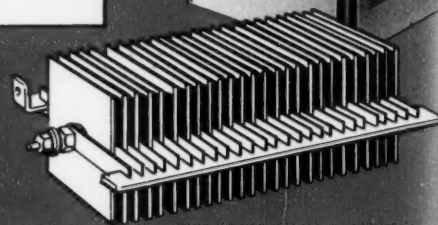
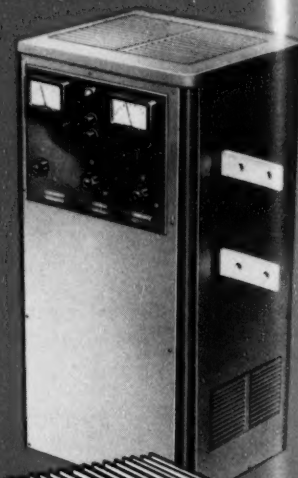
HIGHER EFFICIENCY — Since the heat produced in a rectifier represents a loss of power, a reduction of the amount of heat contributes to the substantially higher operating efficiency of the Wagner Brothers Rectifier.

LONGER LIFE — Service life ratings are normally obtained by testing rectifiers during operation with only convection cooling—the anticipated service life being approximately 25,000 hours. Most rectifiers are forced air cooled; the anticipated normal service life is determined generally by increasing the current density 2½ times the convection rating. Wagner Brothers Rectifier service life is based on a current density of 1.6 times the convection rating and permits a use life far in excess of the usual 25,000 hours.

STANDARDIZED STACK DESIGN — All stacks are of a standard design and are interchangeable, either singly or in groups, in all Wagner Brothers standard rectifiers.

BEST INSULATION — Transformers used in our rectifiers are provided with Class B non-flammable insulation (glass, mica, asbestos, etc.) for safety and extra long service life. Transformers are specially designed for electroplating applications.

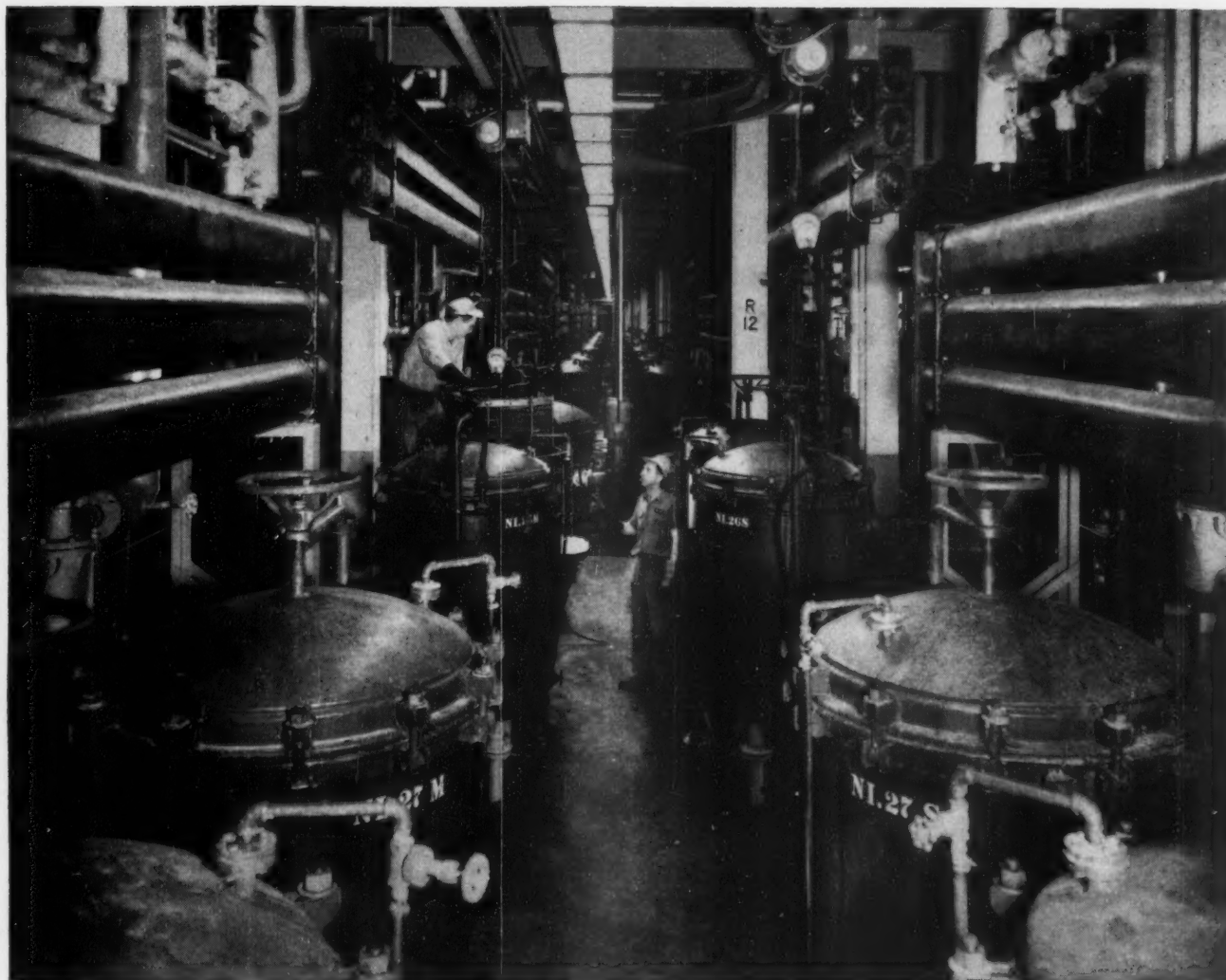
ALSO A COMPLETE LINE OF REGULATORS AND CONTROLS



Write now for free, illustrated Bulletin B 20-54 describing all types of Wagner Brothers Selenium Rectifiers and controls.

WAGNER
BROTHERS, INC.

400 MIDLAND • DETROIT 3, MICH.



48 Sparkler Horizontal Plate Filters in this installation

Why do the largest plating plants in the world Choose SPARKLER FILTERS?

The answer is simple, and obvious to plating engineers.

First — the cake on a Sparkler Horizontal plate filter will not crack or fall off with a variation in pressure or with a complete shut down of filtering. **Second** — dry cake disposal eliminates the sewer problem. **Third** — the quick-change plate

assembly reduces the down time for cleaning each filter to a matter of minutes.

This is why many of the world's largest plating plants use Sparkler Filters exclusively.

Plating engineers can get full cooperation at Sparkler on any size installations.

SPARKLER MANUFACTURING CO., Mundelein, Ill.

Filtration engineering and manufacturing has been our exclusive business for over 30 years

Manufacturing plants in Canada, Holland, Italy, Australia

Service representatives in principal cities throughout the world



"we refer to the chrome plated fire hydrant....

... in front of the Portland, Oregon beauty shop, whose operator felt that an ordinary plug just wasn't glittery enough." (from the *Baltimore Sun*)

"Just what is it, we would like to know, that makes shiny chrome an adjunct to civilized existence? Almost everywhere you look, everywhere you go, chrome plate gleams... from key ring to automatic toaster, from ball point pen to cocktail shaker the idea seems to be, Brother, you aren't living unless it's chrome plated."

The answer is that chromium provides much more than a distinctively pleasing appearance.

It protects metals against tarnish, corrosion and mechanical wear. It is not easily scratched. It is unaffected by heat, smoke, grease. It prolongs the useful life manifold. Original lustre is restored by wiping. There are also engineering reasons such as low coefficient of friction.

Whatever your requirements are for Chromium Chemicals — to plate fire hydrants or to plate diesel engine cylinder liners — you will find Mutual a reliable source of supply.

SODIUM BICHROMATE • CHROMIC ACID • POTASSIUM BICHROMATE



MUTUAL CHEMICAL DIVISION

ALLIED CHEMICAL & DYE CORPORATION

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New **SCHAFFNER** BIAS *buffs*

give more
mileage ...

because

- ... FULLY VENTILATED
- ... COOLER RUNNING
- LOW COMPOUND CONSUMPTION
- ... FEWER SECTIONS NEEDED
- ... GIVES LONGER LIFE
- ... LATHE FACED AND BALANCED

Manufactured and controlled in our own new modern up-to-date Buff plant. Can be tailor made for your toughest buffing problem

MADE BY THE MANUFACTURERS OF FAMOUS AND ACCEPTED SCHAFFNER NO NUBBIN BUFFING COMPOSITIONS.

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Please send me catalogue
and complete information:

NOW PRESENTLY USING _____	Name, Manufacturer and _____
DIAMETER _____	Code No. of Buff _____
CENTER SIZE _____	CENTER SIZE _____
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NAME _____	TITLE _____
COMPANY _____	STREET _____
CITY _____	ZONE _____ STATE _____

SCHAFFNER AIR-COOLED METAL-CENTER BUFFS ARE PRICED RIGHT • PRODUCED IN ALL DIAMETERS, CENTERS, PLYS AND COUNTS

CONTROLLED GRAIN SIZE: APW Extrusion Process* controls grain size within definite limits—*minimizes shedding!*

**ROLLED
FLAT PLATE
ANODE SECTION:**

This Photomicrograph shows highly irregular, uncontrolled grain size—a major cause of shedding and resultant rough electrodeposits.



**APW EXTRUDED
ANODE SECTION:**

Note small, fully controlled regularity of grain size that promotes uniform corrosion, smoothest electrodeposits, less rejects.

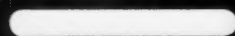


*Pat. Pending

NEW!

SHAPED, EXTRUDED APW SILVER ANODES

STANDARD
SHAPES:



"RECTANGULAR"



"TEAR DROP"



"DOG BONE"

The common problem of shedding and all of its costly results in electroplating can now be virtually eliminated with the radically new extruded, shaped silver anodes made by an exclusive APW-developed process.

The small and uniform grain size produced in the new APW extruded anodes is controlled between definite ideal limits as illustrated above. As a result, corrosion is *smooth and uniform*—with consistently smooth electrodeposits. Rejects are a comparative rarity.

The new APW extruded anode provides equally important advantages by redistribution of mass metal in scientifically determined shapes. While conventional rolled flat plate anodes quickly

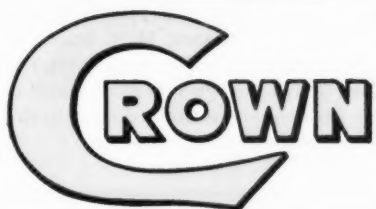
wear to a sharp knife edge from which silver particles break loose readily, APW shaped anodes maintain substantially rounded edges for practically the complete life of the anode. Anode area is also appreciably prolonged. After 85% by weight has been plated off, *this APW anode retains 80% of original active surface area!* You profit with the longer, useful life of the anode . . . polarization is minimized . . . there is less silver scrap to be refined.

APW will develop special anode shapes to meet particular plating bath conditions. You are thus assured of utilizing the silver you buy in anodes most efficiently. Feel free to consult us on any anode problems you may have. ★ ★ ★

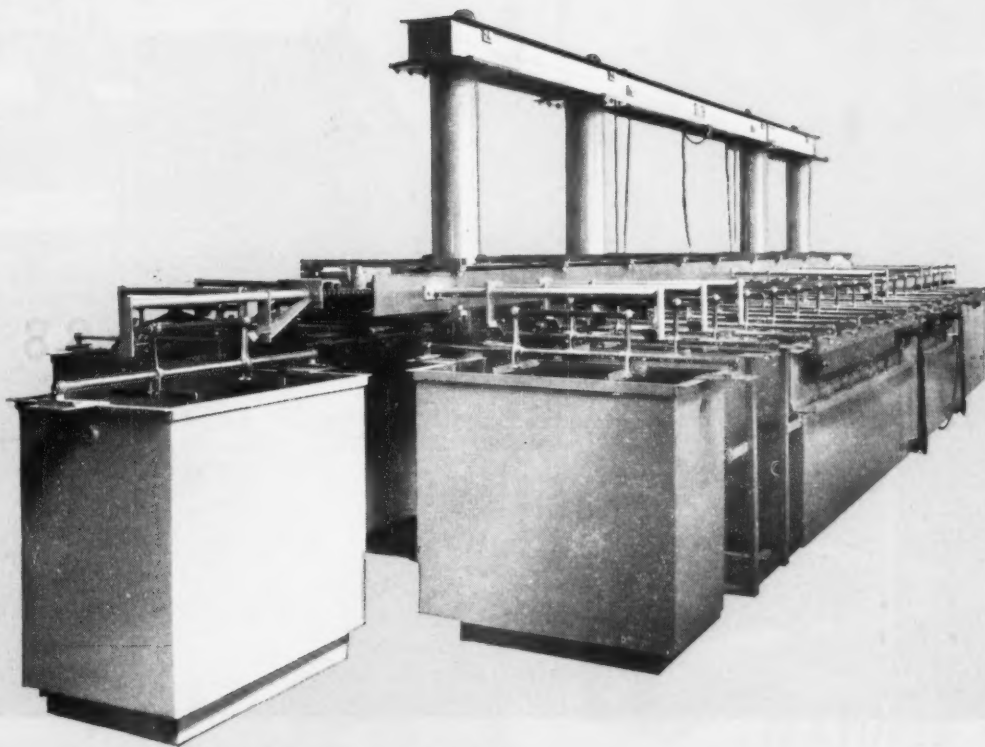
THE AMERICAN PLATINUM WORKS

231 NEW JERSEY RAILROAD AVENUE • NEWARK 5, NEW JERSEY





TYPE "B" AUTOMATIC



you'll be agreeably surprised . . .

- At the high production
- At the low cost
- At the high quality
- At the low rejections

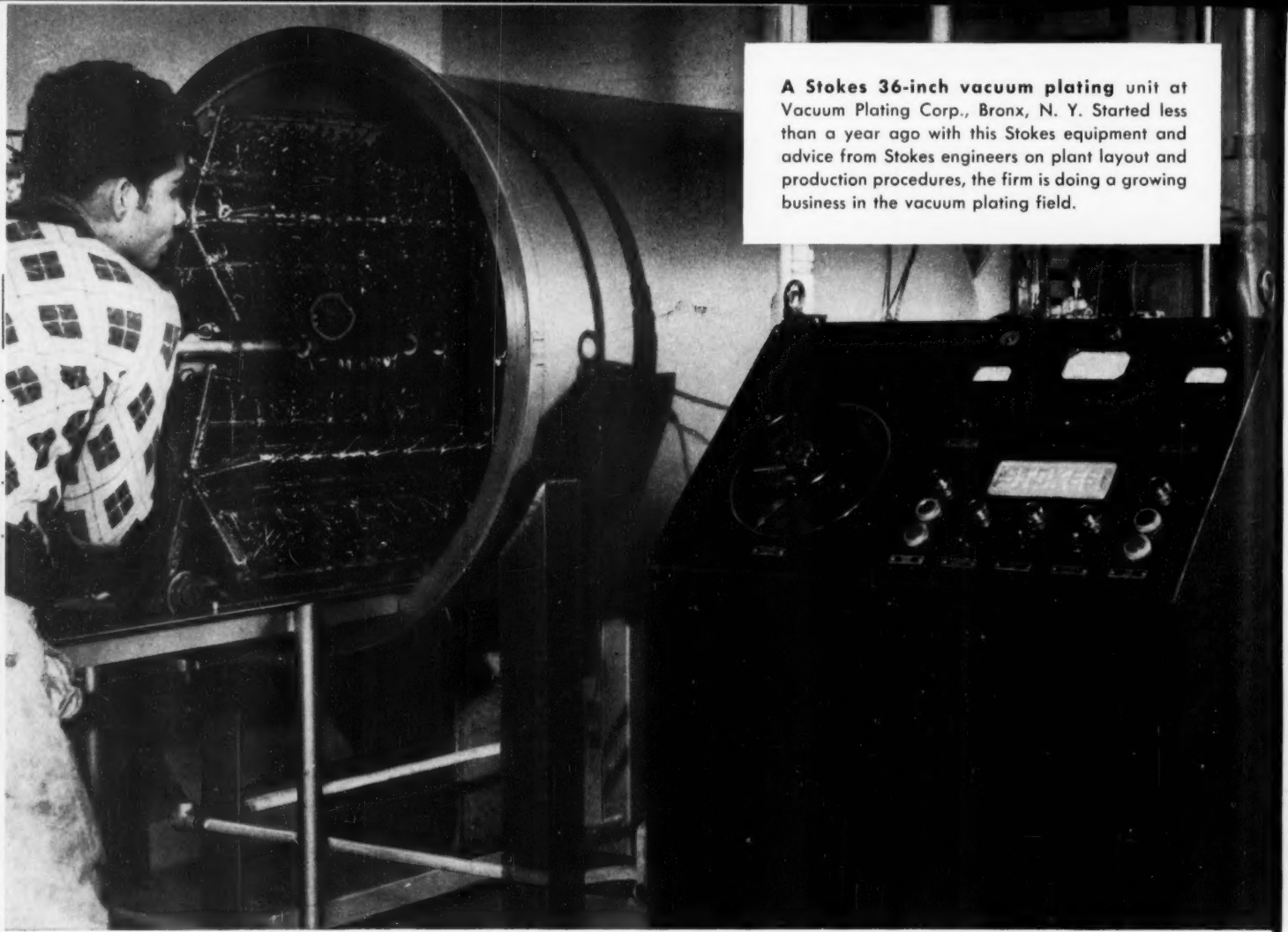
Whether your plating requirements are for high production of small parts or moderate production of large parts, there is a Crown Type "B" machine that will automatically travel your work through the entire treatment cycle — on schedule.

Write us details of your treatment cycle and production requirements for further information

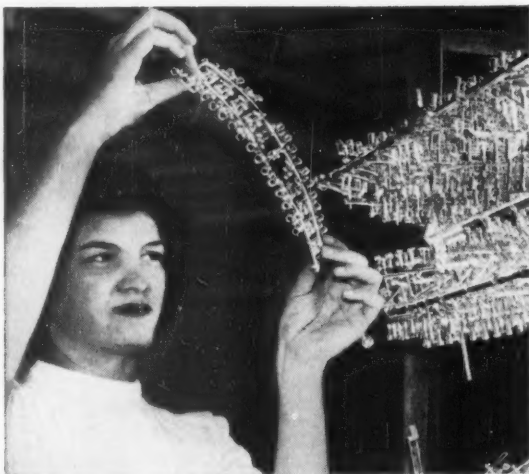
CROWN RHEOSTAT AND SUPPLY COMPANY

3465 N. KIMBALL AVENUE • CHICAGO 18, ILLINOIS

A Stokes 36-inch vacuum plating unit at Vacuum Plating Corp., Bronx, N. Y. Started less than a year ago with this Stokes equipment and advice from Stokes engineers on plant layout and production procedures, the firm is doing a growing business in the vacuum plating field.



The first high-production vacuum plater selling for less than \$10,000



Brilliant, durable plated parts are produced in quantity at Vacuum Plating Corp.

For firms just entering the vacuum plating business or for those expanding their operations in this growing finishing field, the Stokes 36-inch vacuum plating unit offers unusual advantages:

- 1) Low cost
- 2) Fast, 15-minute over-all cycle time
- 3) Simplified, push-button operation
- 4) High capacity...200% greater than conventional 30-inch units
- 5) Interchangeability...the four part racks can be used in larger Stokes units, if operations demand more capacity.

Stokes builds vacuum plating equipment in 24, 48 and 72-inch sizes as well. Our vast experience in the application of this popular finishing method is at your service, to plate your sample parts and advise on efficient plant layout. Send for an informative brochure on the Vacuum Metallizing Process, Catalog 780.

F. J. STOKES MACHINE COMPANY
5531 TABOR ROAD, PHILADELPHIA 20, PA.

OFFICES IN PRINCIPAL CITIES, REPRESENTATIVES THROUGHOUT THE WORLD

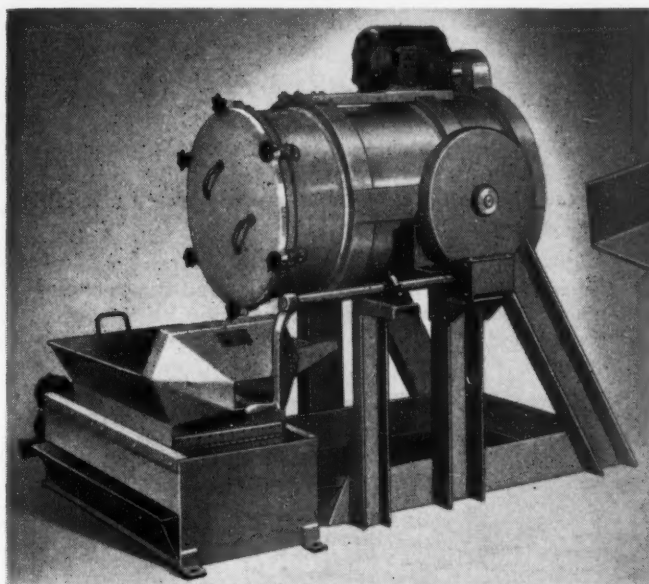
STOKES

Belke

BURNISHING BARRELS

★ **Service Proved
for 20 years**

- ★ Barrel revolves in two large diameter, radial thrust ball bearings assuring smooth operation regardless of barrel position
- ★ Compact, direct gear drive — eliminates belts and pulleys.



**BELKE Model C Burnishing Barrel
With Motor-driven Separator**

Saves Time — Saves Labor — Saves Space

Large capacity barrel has worm screw tilting mechanism that positions barrel for loading burnishing and unloading.

Finished work pours from Burnishing Barrel right into Separator without handling. Motor drive shakes screen to separate media from work.

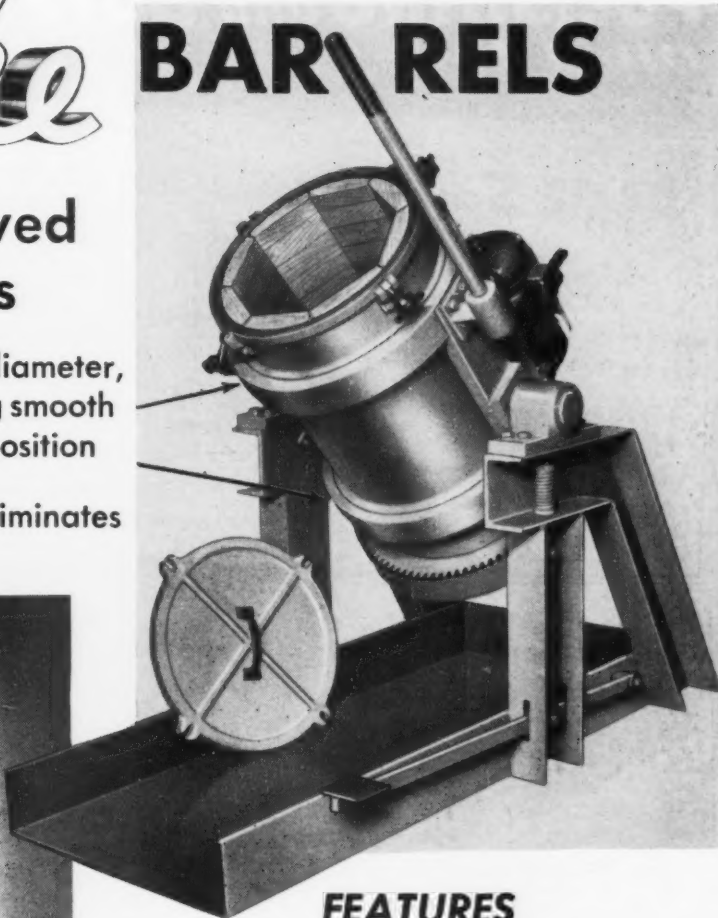
Tilting hopper and removable drawer speed removal of media and finished work.

Easily interchangeable screens framed in wood protect finish of work. Mesh sizes and shapes to specifications.

Motor driven separators available for all Belke Burnishing Barrels.

Ask your **BELKE Service Engineer** or write.

METAL FINISHING, August, 1955



FEATURES

- ★ **Smooth Operation.** Patented bearing construction assures smooth running with cylinder in any position — No vibration even with capacity load.
- ★ **Direct Gear Drive.** Gears enclosed. No belts.
- ★ **Motor Mounted on Top.** Stays dry. Out of the way. Easily accessible.
- ★ **Constant or variable speed drive.**
- ★ **Barrel Balanced** for easy tilting.
- ★ **Self-Sealing Cover** of light weight aluminum.
- ★ **Spring pressure Ratchet Lock** released by foot lever — holds barrel at any angle.
- ★ **Rugged Frame** of welded steel affords absolute rigidity. Will not warp or twist on uneven floors.
- ★ **Base is Flanged** to receive tote tray.
- ★ **Hard Maple Lining**—easily removable. Rubber lining or steel ribs welded to inside surfaces available.
- ★ **Three Models** — The right size for every shop.

Ask your **BELKE Service Engineer** or write.

Belke

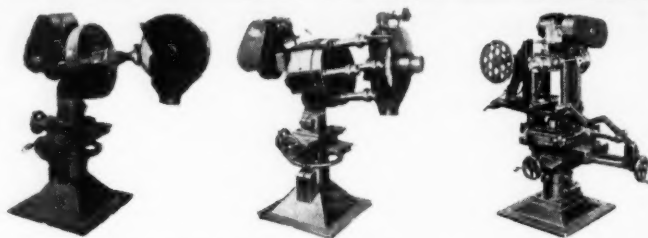
Manufacturing Company
947 N. Cicero Ave., Chicago 51

EVERYTHING FOR PLATING PLANTS

ACME *Automatics* PUT POLISHING and BUFFING OPERATIONS on a low cost production basis . . .

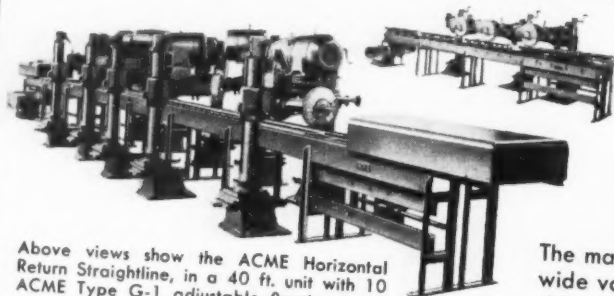
ACME *Semi-Automatics*

ACME Semi-Automatics are built to "deliver the goods." They can be fully relied upon to cut finishing costs, maintain production levels and stand up under long hours of operation!



The three ACME Semi-Automatics above are from left to right, the ACME A-2, a 2 spindle hand indexing machine for polishing and buffing cylindrical parts up to 12" diameter . . . the ACME L-4, a 4 spindle automatic indexing machine with a normal range of 250 to 400 indexes per hour . . . and the ACME D-10, an oscillating machine for finishing out of round parts. These machines are proved producers.

WRITE FOR CATALOG ILLUSTRATING WIDE RANGE OF TYPES



Above views show the ACME Horizontal Return Straightline, in a 40 ft. unit with 10 ACME Type G-1 adjustable floating head polishing and buffing lathes . . . and a 20 ft. unit with 3 ACME Type G-3 lathes.

ACME *Straight Lines*

ACME Straightlines provide effective solutions to many finishing problems. ACME progressive experience and engineering assure dependable performance at high production levels.

The machine illustrated is unusually versatile and adaptable to a wide variety of work. It may be loaded or unloaded from either side or either end. Polishing and buffing heads may be used on either or both sides and may vary in number to suit the required production and finish.

WRITE FOR OUR STRAIGHTLINE CATALOG ILLUSTRATING OTHER TYPES

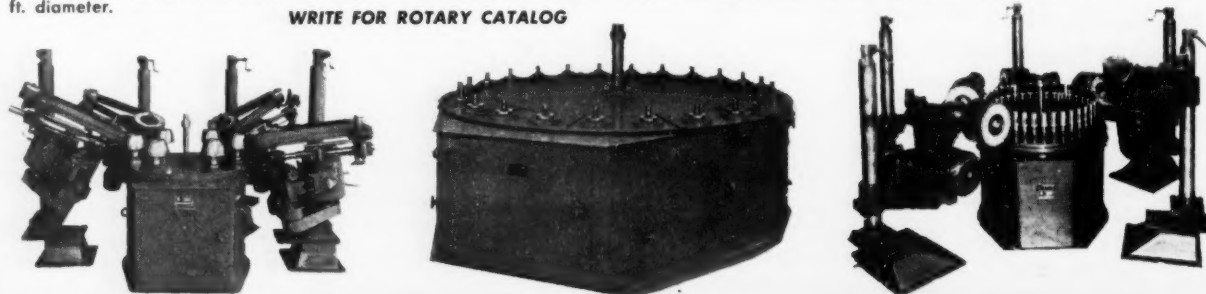
ACME *Rotary Automatics* . . .

ACME 40" Rotary with 6 station indexing table and 4 ACME Type G-1 lathes with belt arm attachment. One second indexing time . . . up to 1800 indexes per hour. Acme Indexing Rotaries are available in table sizes from 18 in. to 10 ft. diameter.

ACME 10 ft. Combination Rotary . . . for continuous operation using 24 continuously revolving spindles or for 12 station indexing operation using every other spindle. One second indexing time . . . up to 1200 indexes per hour.

ACME 50" Continuous Rotary Automatic with 40 spindles equipped with 4 Acme Type G-3 heavy duty 15 H.P. polishing and buffing lathes with inverted spindles. ACME Continuous Rotaries are available with tables up to 24 ft. diameter.

WRITE FOR ROTARY CATALOG



for POLISHING • BUFFING
GRINDING • MICRO-FINISHING
DE-BURRING • WIRE BRUSHING



ACME Manufacturing Co.
Builders 1400 E. 9 MILE RD., DETROIT 20 (Ferndale) MICH.
OF AUTOMATIC POLISHING AND BUFFING MACHINES FOR NEARLY HALF A CENTURY

Put this "Plus" in your polishing

ALUNDUM* B abrasive
adds the time-saving
product-improving
"TOUCH of GOLD"
to every set-up

Here are the reasons why ALUNDUM B abrasive in your polishing set-ups will help each wheel last longer, produce more, and polish better:

Excellent cutting action. This development of Norton's famous ALUNDUM abrasive cuts fast, clean and cool — ideal for polishing jobs ranging from roughing to finishing.

Controlled uniformity. Grains are of uniform blocky shape. No flats, slivers or undersized grains to loaf on the job. No oversized grains to mar surfaces.

Maximum adhesion. Norton's special treatment for high capillarity keeps grains from pulling out before each has done its full share of work. Whether you use cement or glue, you get this same firm-clinging action that means longer, more productive wheel life.

Made in all grit sizes, from 20 through 240, to cover the widest range of polishing operations.

Your Norton Distributor

is ready with prompt service on ALUNDUM B polishing abrasive. Or write to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities, listed under "Grinding Wheels" in your phone directory, yellow pages. *Export:* Norton Behr-Manning Overseas Incorporated, Worcester 6, Mass

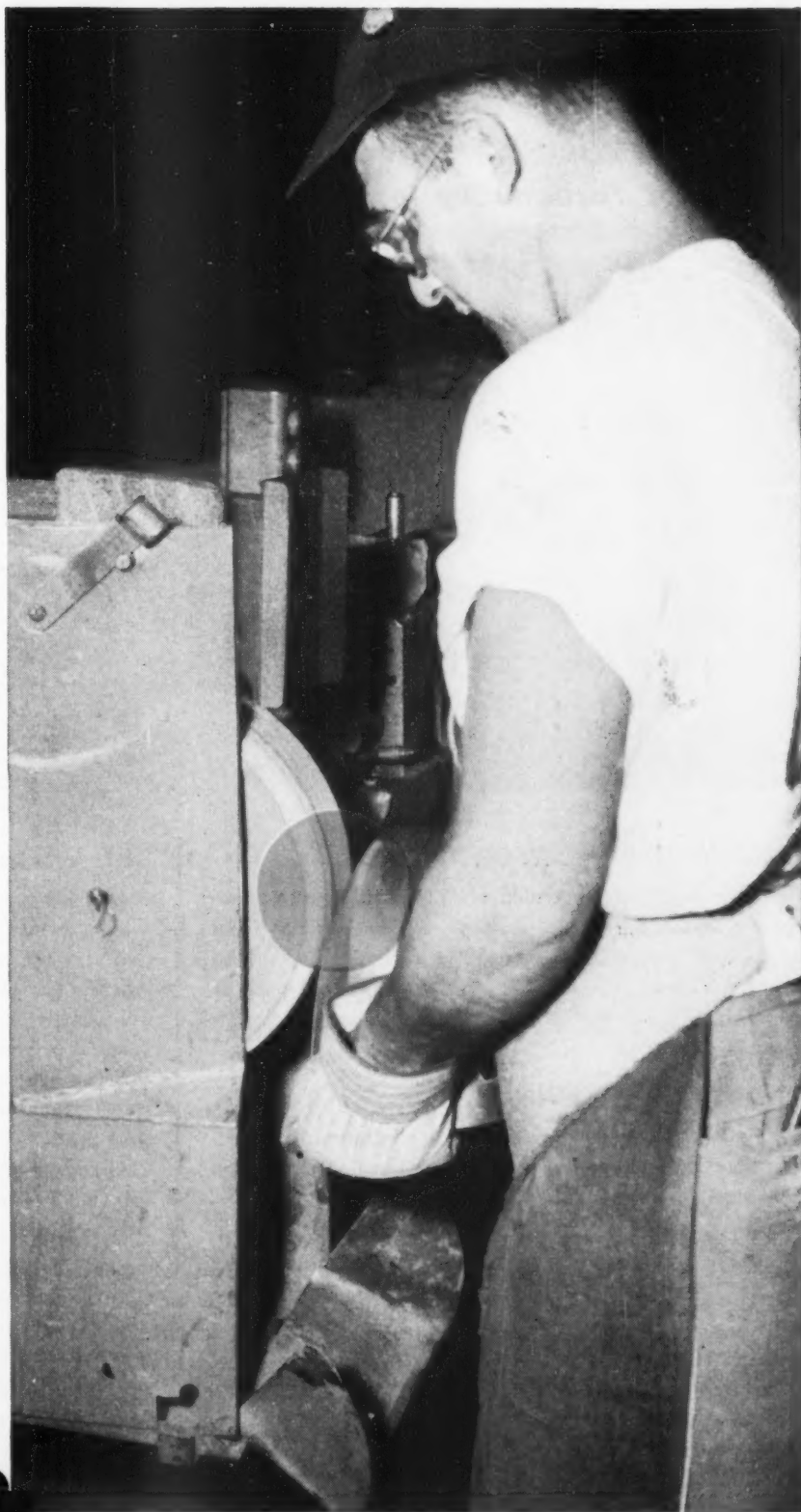
G-289

*Making better products...
to make your products better*

NORTON

and its BEHR-MANNING division

NORTON COMPANY: Abrasives • Grinding Wheels • Grinding Machines • Refractories
BEHR-MANNING DIVISION: Coated Abrasives • Sharpening Stones • Pressure Sensitive Tapes



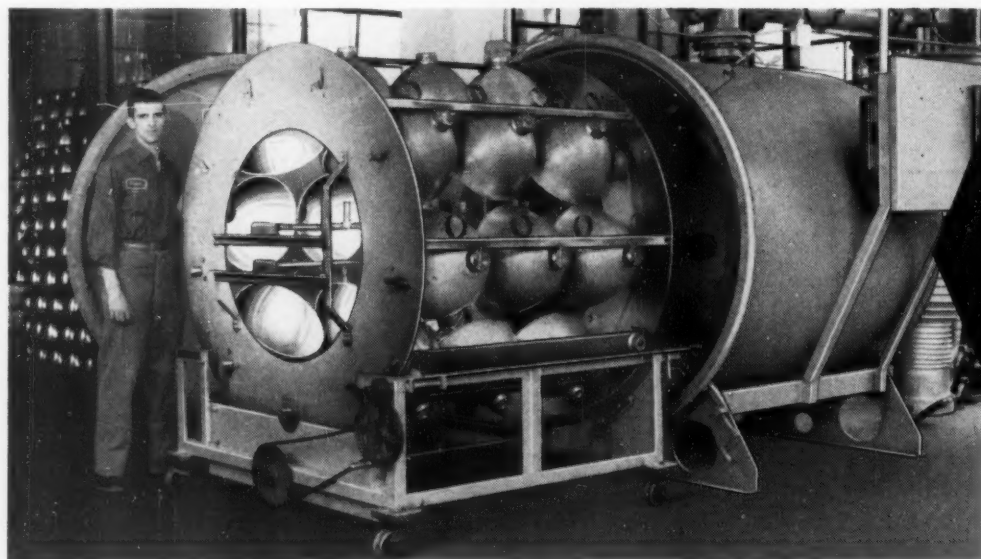
*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Should You Use VACUUM COATING ?

Would a Colorful Metallic Finish Add Sales Appeal to Your Product?

Do You Want a Metallic Finish on a Non-Metallic Product?

Would Vacuum Coating Cut Your Production Costs?



This NRC
"Rapid Cycle"
vacuum coater
cuts unit finishing
costs from
\$4.00 each
to 95¢ each,

*and, best of all,
customers like the
new product better.*

NOW YOU CAN AFFORD COLOR

The gleaming, colorful metallic surface provided by vacuum coating is the answer to competitive demands for color where quality must be maintained, but pennies have to be pinched. Vacuum coating adds a bright shiny finish to metal, plastics and many other materials. The range of colors is virtually unlimited.

PRODUCTION SAVINGS

Buffing and polishing operations are eliminated. Inexpensive base materials can be used. There is no need for skilled operators.

THE GUESSWORK IS GONE

From experience in all phases of vacuum coating, we know that, spectacular as it is, vacuum coating is no cure-all. Tell us what you are processing now, and let us tell you whether you can benefit from this technique. If vacuum coating can help you, we'll supply you with vacuum-coated samples of your own product, in a selection of colors so that you can evaluate them for performance and sales appeal. We'll give you production rates and unit costs for coating your product. Provide a complete system engineered to your requirements. Install it, train your operators and stay on the job until it is operating to your satisfaction.

Send us the story on your operations today, or use the coupon to get more information.

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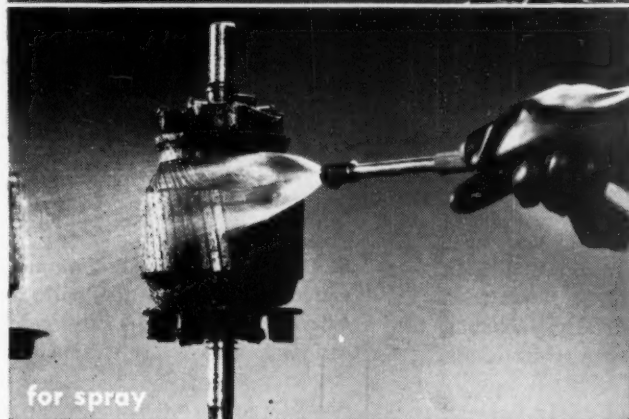
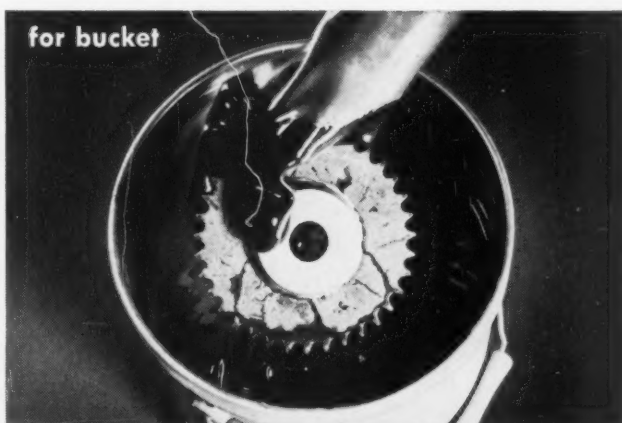
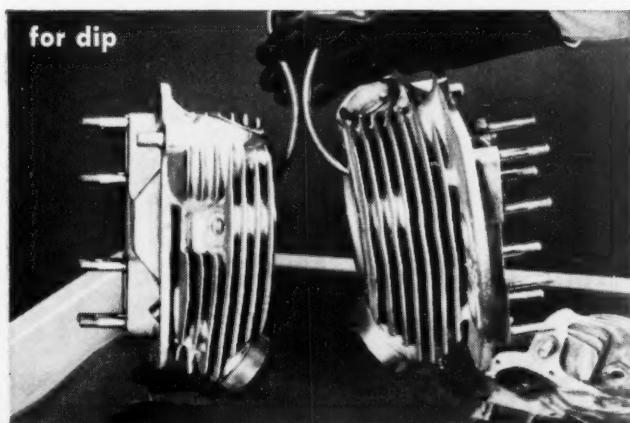


DOW... industry's most complete line of chlorinated solvents



CHLOROTHENE

for dip ... bucket ... spray ... wipe



Get high-solvent-power cold degreasing plus all this
SAFETY... low toxicity, no flash or fire point

Chlorothene† is described by enthusiastic users as "The best general-purpose cold degreaser we've ever found—by far the *safest*—and the *easiest* to use." Chlorothene (Dow 1,1,1-Trichloroethane, Inhibited) removes greases, oils, tars, waxes and other contaminants with the cost-saving *speed* of carbon tetrachloride and with a much greater degree of *safety* (M.A.C. for carbon tetrachloride is 25 ppm., whereas the M.A.C. for Chlorothene is 500 ppm.). And you get superior protection from *fire hazards* present with petroleum solvents: Chlorothene is certificated* for use as a ships' stores article by the U. S. Coast Guard. All common metals, including aluminum,

can be cleaned with relative safety from corrosion.

Versatile, easy handling Chlorothene is made *exclusively* by Dow. Contact your local Dow distributor today for a supply. And don't forget that he can meet all your *vapor degreasing* solvent needs, too, with stabilized Dow Trichloroethylene and Perchloroethylene. If you're in doubt about how to reach *your* Dow distributor, or would like more detailed Chlorothene information, write direct to THE DOW CHEMICAL COMPANY, Dept. S 669A, Midland, Michigan.

*203

Certificated for use as an article of stores on board vessels. This certificate covers only hazard in the use of this product. The efficiency of this product is not passed upon. U. S. Coast Guard.

26 April 1955

†Trademark

you can depend on DOW SOLVENTS



A SPECIAL REPORT ON PROTECTIVE FINISHES FOR ALUMINUM

Most aluminum producers and fabricators are well aware of the superiority of chemical finishes over anodizing for the protection of aluminum from corrosion. Naturally, then, there is a running battle for acceptance among the leading producers of the protective chemical finishes.

That's why, here at Allied, we have always studied your needs with regard to both our own and competitive processes. We're constantly trying to produce new and better finishes because we believe there's always room for improvement . . . even to our own products. Some years ago this policy led to the introduction of a process, long in development, that offered you a way to overcome anodizing's obvious technical complications . . . Iridite #14. This finish was far easier to use than anodizing, yet provided comparable, if not superior, quality. And, its cost was much less than anodizing.

But other finishes offering similar advantages over anodizing have entered the market. So . . . the current battle for acceptance. By any cost comparison Iridite #14 is the most economical. However, corrosion tests by users show contradictory results as to performance from Iridite #14 and other leading protective finishes for aluminum. Most tests show Iridite #14 superior, but some do not. The margin of difference, however, is always small. The truth is that all have proved good. However, our laboratory research indicated that still further improvements could be made.

That knowledge . . . plus our aim to give you even better protection and maintain the leadership of the industry, is exactly why Allied Development Engineers have been working for long years to develop a better finish than any of those now available, including our own Iridite #14.

Now the new finish is ready for you. It's called Iridite #14-2 (Al-Coat).

From a performance standpoint, Iridite #14-2 gives you two important advantages in the protective finishing of aluminum.

FIRST: in its fully colored brown film stage it provides corrosion resistance decidedly superior to previous processes.

SECOND: the basic brown film can be hot water bleached to produce a clear-type film with protection heretofore unobtainable from clear-type chemical finishes.

From an operating standpoint, new Iridite #14-2 gives you three important advantages.

FIRST: it provides consistently

higher corrosion resistance for different aluminum alloys treated in the same bath.

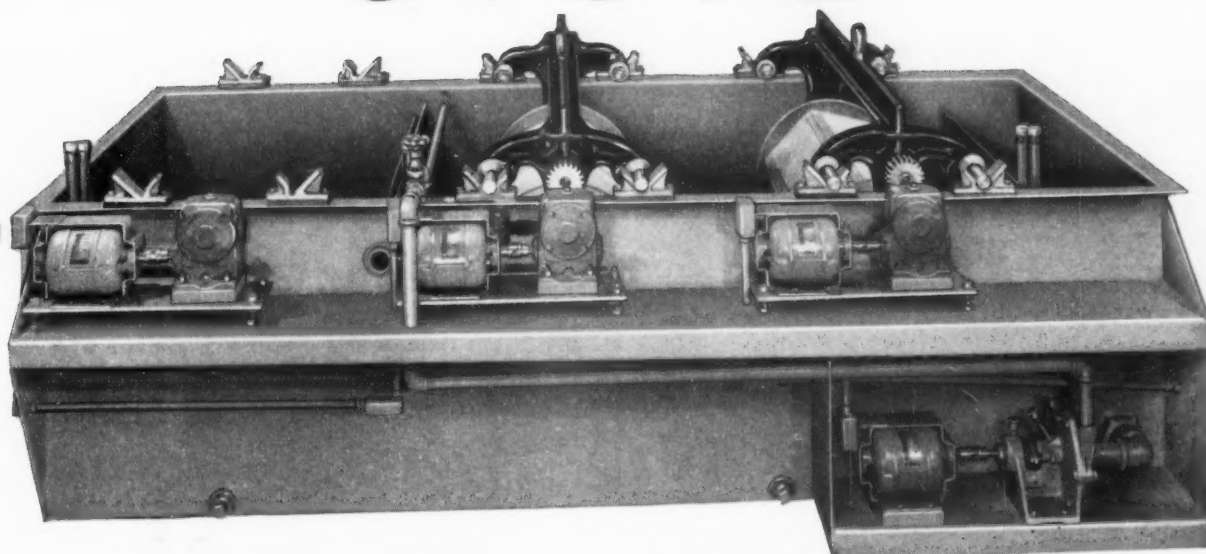
SECOND: it provides a more uniform appearance for parts of different alloys and with varied surface finishes before treatment.

THIRD: its operating and technical characteristics are superior to those of other processes.

If you are using or planning to use a chemical finish for aluminum, you should have full details on new Iridite #14-2. Write us or send samples for free test processing. Or, for more immediate advice, call your Iridite Field Engineer. He's listed under "Plating Supplies" in your classified telephone book. - - - ALLIED RESEARCH PRODUCTS, INC., 4004-06 EAST MONUMENT STREET, BALTIMORE 5, MARYLAND.

P. S. Even new Iridite #14-2 will be constantly measured against both your needs and competitive processes to make sure you get the best possible, most economical finish for your product that man and the laboratory can develop.

STUTZ



Alkali Cleaning and Rinsing Units

**Also for De-scaling and Rust Removal
for heavy duty - high speed Production**

Stutz design in single or multiple units with or without rinsing compartment. Solution circulating pump for rapid elimination of surface grease into trap from which complete removal made by draining of trap compartment daily.

Rotation of work in cylinders together with solution agitation of pump provides complete cleaning in a single operation.

Cylinder drive and pump motors are 1/3 h.p. 440-220-3-60 with heater type motor control switches. Plate or pipe coils installed.

With this type of equipment, vapor degreasing is not required.

Can also be furnished for electrolytic cleaning.

For de-scaling and rust removal above units require periodic reverse current.



STUTZ Portable Plating Barrels

Made in 2 standard
sizes.

Standard openings - 3/32"	
6" x 12"	\$176.50
8" x 18"	\$275.00
Stand	\$ 37.50
Basket	\$ 8.65

- The Stutz Portable Barrel is made in 2 standard sizes with cylinders having inside dimensions of 6" x 12" and 8" x 18".
- Load/Unload Stand for convenient and fast handling of work load.

Write for prices and New 1955 catalog

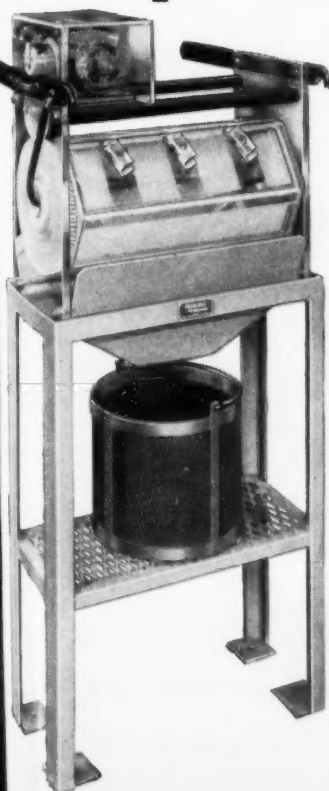
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4430 CARROLL AVENUE

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"Complete metal finishing equipment and supplies"



THE ANSWER TO YOUR TANK HEATING PROBLEMS

FOR ACID HEATING JOBS

FOR ALKALINE HEATING JOBS



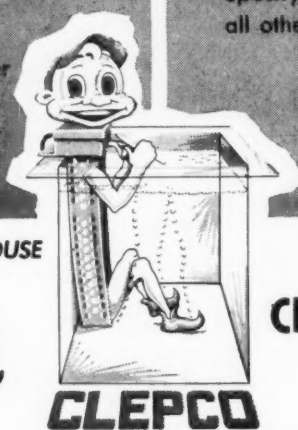
G SERIES FUSED QUARTZ IMMERSION HEATERS

Over 40,000 CLEPCO Fused Quartz Heaters now in service.

Dependable, controlled heat at low operating cost.

Wide range of Standard Sizes for every need.

Only Fused Quartz Heater recommended and sold by all leading plating supply houses.



W & WS SERIES STEEL AND STAINLESS IMMERSION HEATERS

Specify CLEPCO Non-Magnetic Stainless Steel Heaters for your alkaline electro cleaners and bright copper plating tanks.

Specify CLEPCO Steel Heaters for all other alkaline tanks.

All leading Plating Supply Houses can furnish from stock.



SEE YOUR PLATING SUPPLY HOUSE

Clepco

WRITE US FOR LITERATURE

CLEVELAND PROCESS COMPANY

1965 EAST 57th STREET

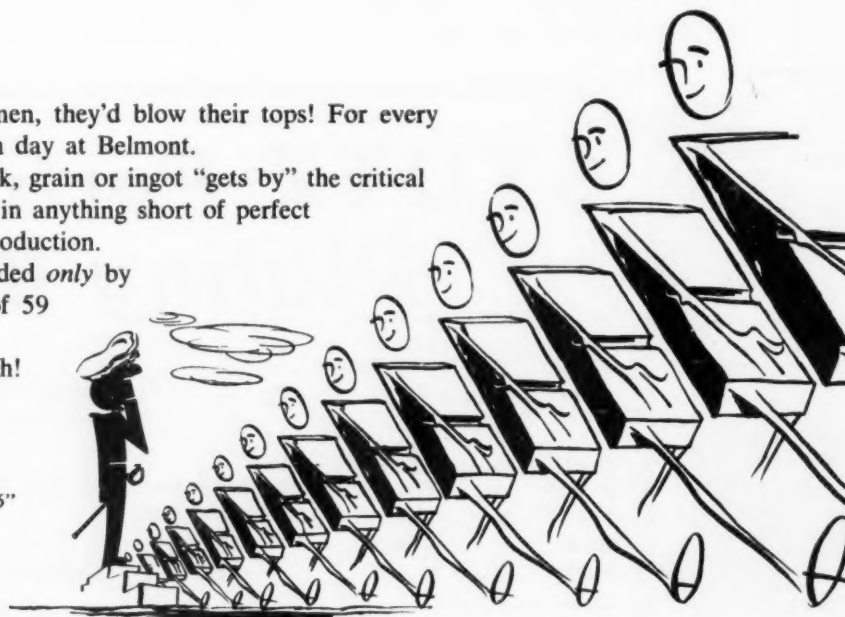
CLEVELAND 3, OHIO

Every day is Saturday... *at Belmont!*

If our ingots were infantrymen, they'd blow their tops! For every day—and all day—is inspection day at Belmont. Not a single drop, square, stick, grain or ingot "gets by" the critical eye of Belmont metal experts in anything short of perfect condition...at any stage of production. And Belmont quality is exceeded *only* by Belmont service—the result of 59 years of "falling in" on time. Better buy Belmont... for both!



"Putting Mettle into Metals Since 1896"



Belmont

SMELTING & REFINING WORKS, INC. 304 Belmont Ave., Brooklyn 7, New York

MICCRO COATINGS

Make Tough Jobs EASY!

MICCROSOL
E-1003



Today's outstanding heat-cured rack coating. Meets industry's highest standards for corrosion and abrasion resistance.

MICCROSTOP



For extreme accuracy in masking parts for all plating cycles.

MICCROMASK



Provides complete masking protection for hard chromium plating.

MICCROPEEL



A special lacquer that can be peeled easily from parts after all plating cycles.

MICCROWAX



Two waxes widely used for selective stop-off. C-562 for hard chromium; C-600 for high temperature cycles.

MICCROTEx



An air-dry rack coating for all plating cycles. Excellent for patching and repairing.

MICCROTAPE



An extruded tape which provides unexcelled protection for plating racks, and for masking parts prior to selective plating.

MICCROTUBE



Extruded tubing especially suited for use on contact wires, and for selective plating of simple parts.

MICCROLOID



Corrosion-resistant industrial maintenance paint.

THEY'RE
TOPS!



Developed and manufactured
by experienced platers

• WRITE FOR PARTICULARS ON COMPANY LETTERHEAD



MICHIGAN CHROME and Chemical Company

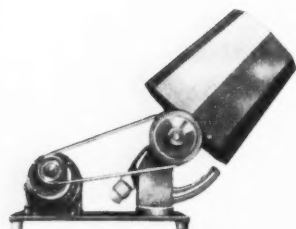
8615 Grinnell Avenue • Detroit 13, Michigan



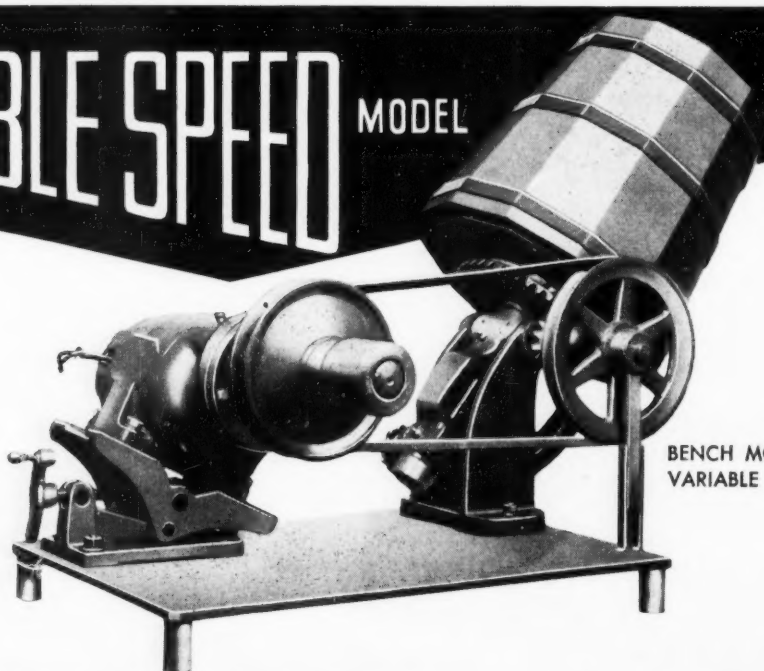


INTRODUCING — our NEW

VARIABLE SPEED MODEL



Bench-Type Single Speed



BENCH MODEL
VARIABLE SPEED

Note Carefully These IMPORTANT POINTS

Barrels can be filled with parts or abrasive — *while running*.

Work can be watched — samples removed for inspection — *while running*.

Angle can be changed for best abrasive or polishing action — *while running*.

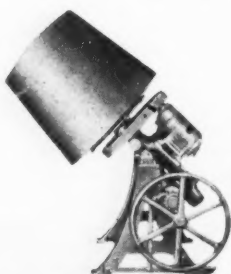
Barrels can be emptied by tilting to pouring position — *while running*.

Barrels are made in various sizes, shapes, and materials. They are easily replaced.

If You're a Tumbler, Send
for This NEW CATALOG

THE HENDERSON BROS. COMPANY
"The Tumbling Barrel People"

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WATERBURY, CONNECTICUT



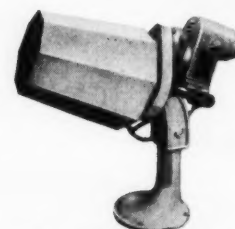
No. 6—Single Speed



No. 5A—Single Speed



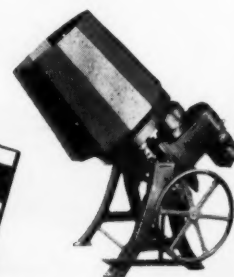
No. 5—Single Speed



No. 5—Variable Speed



No. 5A—Variable Speed



No. 6—Variable Speed



SINCE 1880

DESIGNERS AND BUILDERS OF TUMBLING BARREL EQUIPMENT





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Lead Fluoborate
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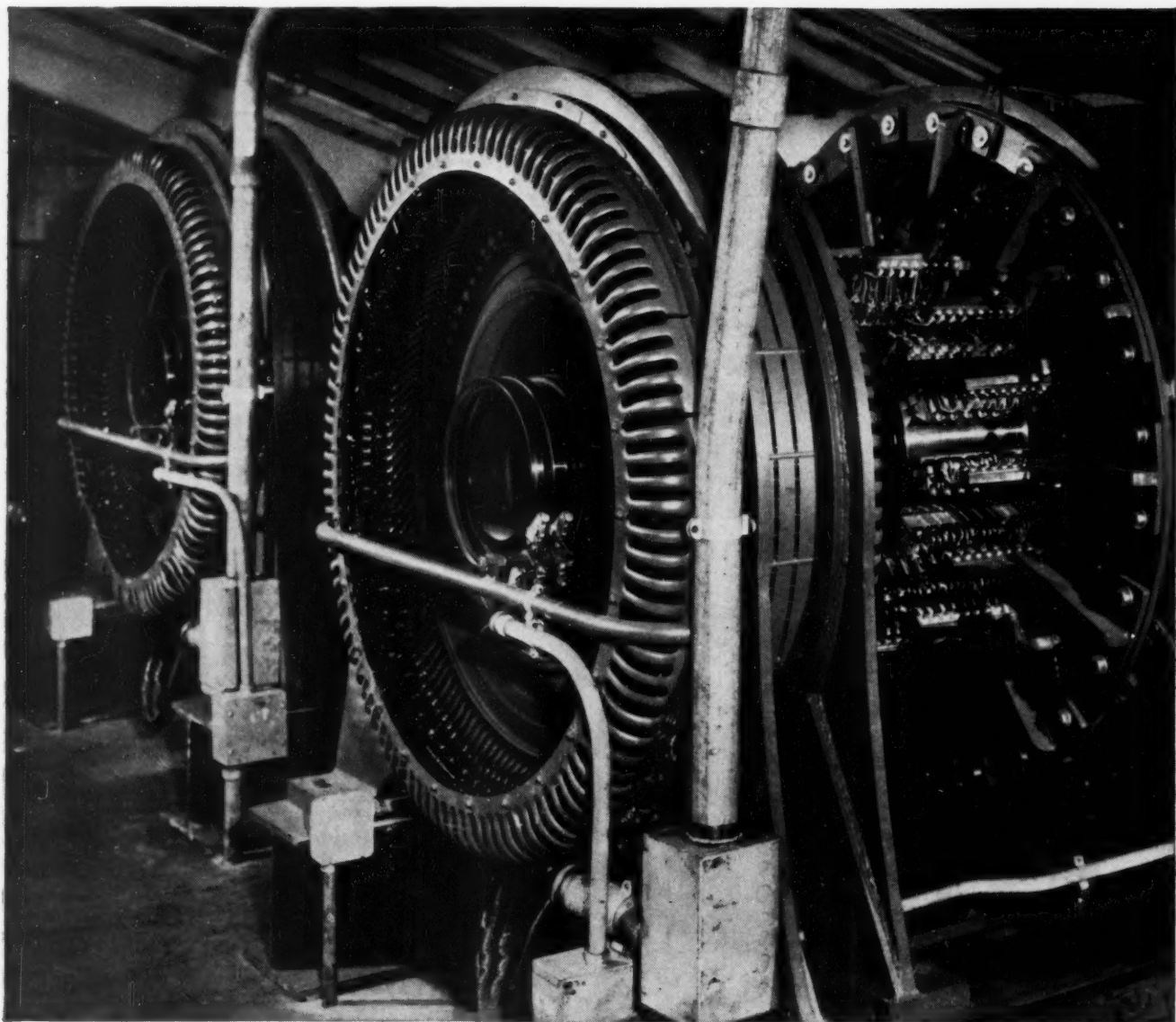
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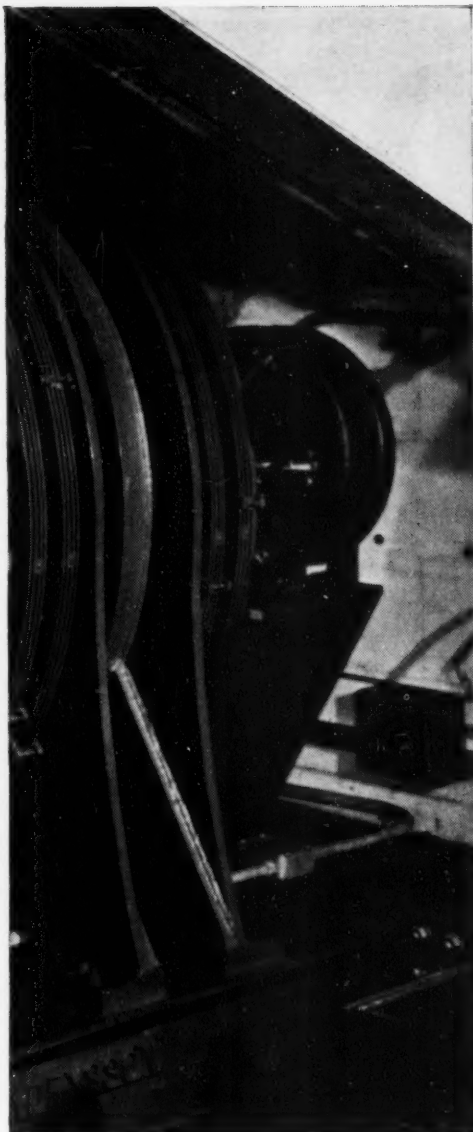
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easier to maintain . . . Baird Model H
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Every control is at the operator's fingertips. Every detail is planned for trouble-free operation, maximum utility, and simplified maintenance. Manual-hydraulic or power tilting.

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4792

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MACHINES • AUTOMATIC PRESSES • TUMBLING BARRELS**

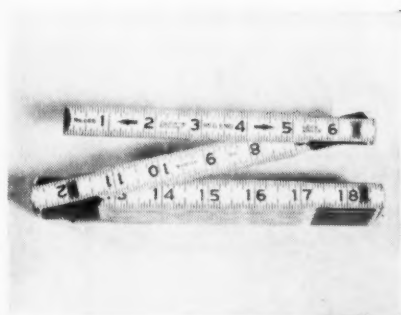


Better luster, savings in time and money are reported by Lufkin Rule Co. as a result of switching to BURNEK 22. Above,

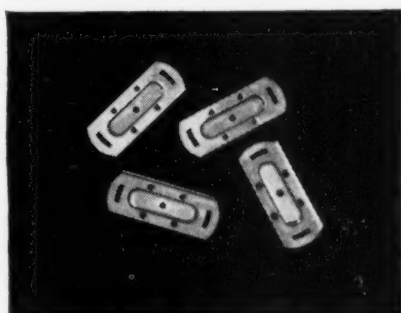
barrel is emptied after burnishing operation. Lufkin also uses Wyandotte 444-C, brush-on paint stripper, to salvage steel tape.

How to get brilliant luster at lowest cost

Use Wyandotte's Burnek 22, says Lufkin Rule Co.,
Saginaw, Mich. Here's why:



Here is a typical rule which has brass spring joints — made at Lufkin Rule Co.



These are the spring joints which are used on the rule pictured above. Note luster.

A continuous search. The Lufkin Rule Company burnishes all brass spring joints on its rulers before their final assembly. In a continuous effort to improve the results of the finishing operation, the company had tried a wide range of burnishing compounds, including soap chips, but without sufficient success to meet their standard of quality. Recently they switched to Wyandotte's BURNEK 22.

Change for the better. "BURNEK 22 gives us better luster than we've been able to get with any other product," says Divisional Superintendent J. H. Farmer. "And it dissolves completely . . . faster. Rinsability? Excellent! It's easy to get really clean parts with BURNEK 22."

Burnishing costs have been substantially cut at Lufkin Rule because, they report, BURNEK 22's easy rinsing and solubility have

saved time and money. They use less water for rinsing. And a little BURNEK 22 goes a long way!

A call that will pay. If you're looking for ways to improve your metal cleaning or finishing operations, call your Wyandotte representative today. Wyandotte products are research-developed and production-proved to give you the best results . . . at lowest use-cost. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Also Los Nietos, Calif. Offices in principal cities.*

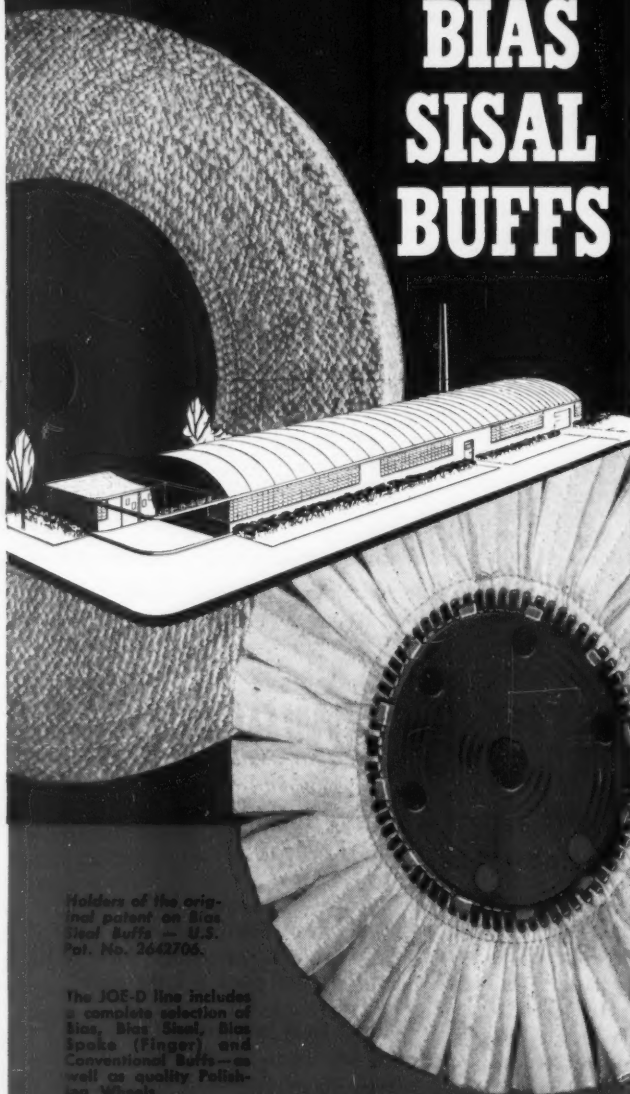
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Remove shop dirt, oil, grime and compounds from metal quickly... and completely at room temperatures. That in brief is the story of International-504, the new amazingly efficient cold cleaner for washing machine use.

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In terms of lower cleaning costs and more effective results, it will pay you to get the facts about International-504—the superior cold cleaner.

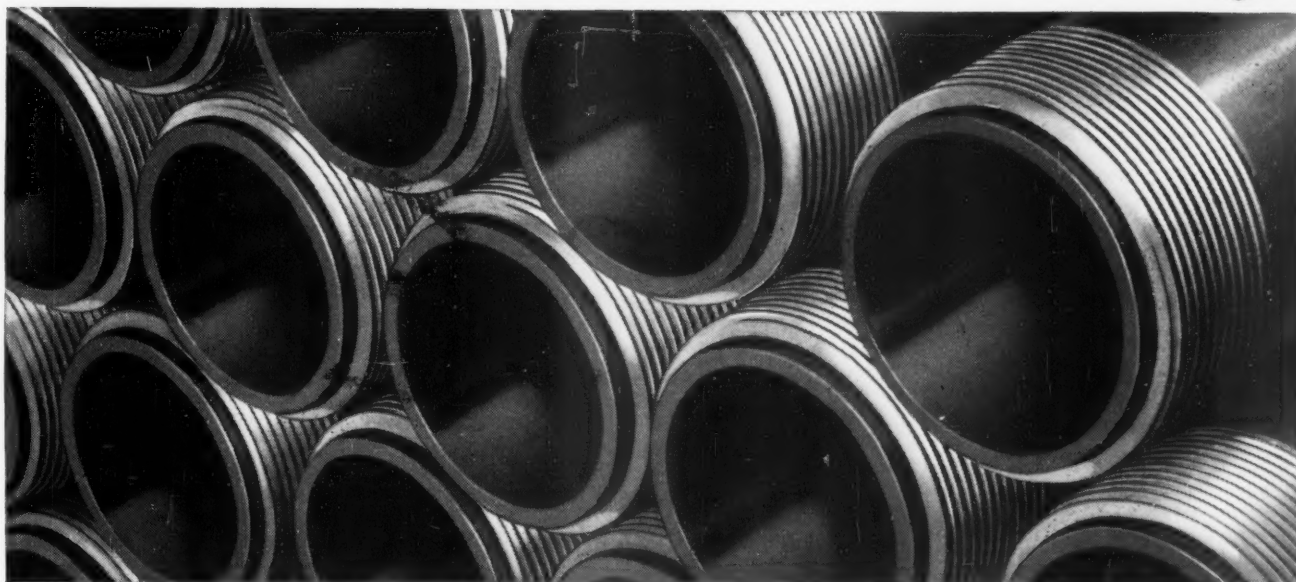
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Here's really trouble-free piping . . . saran lined pipe, fittings and valves! This modern piping has a durable inner lining that eliminates shutdowns due to corrosion . . . forms tight-fitting joints that prevent leakage. Saran lined pipe, fittings and valves won't burst under working pressures up to 150 psi . . . and saran lined cast steel fittings are available for even higher pressures. Every single piece of saran lined pipe, fittings and valves is carefully spark-tested by hand to be sure there are no pinpoint holidays or cracks in the lining.

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If your operation requires the conveying of acids, alkalis, solvents and other corrosive liquids, be sure to investigate saran lined pipe, fittings and valves today. For further information, write the Saran Lined Pipe Company, 2415 Burdette Ave., Ferndale 20, Michigan, Dept. SP-529C-1.

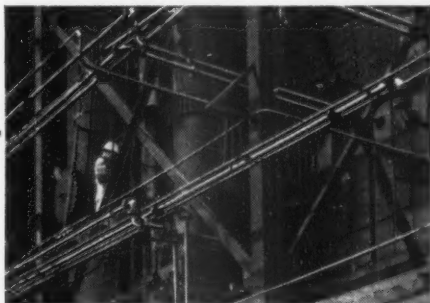
RELATED SARAN PRODUCTS—Saran rubber tank lining • Saran rubber molding stock • Saran tubing and fittings • Saran pipe and fittings.

SOME OF THE MANY
INSTALLATIONS USING

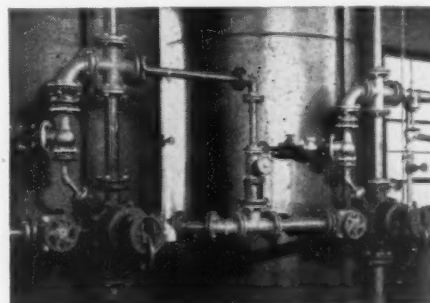
SARAN LINED

STEEL PIPE

*Saran Lined Pipe is Manufactured by
The Dow Chemical Company
Midland, Michigan*



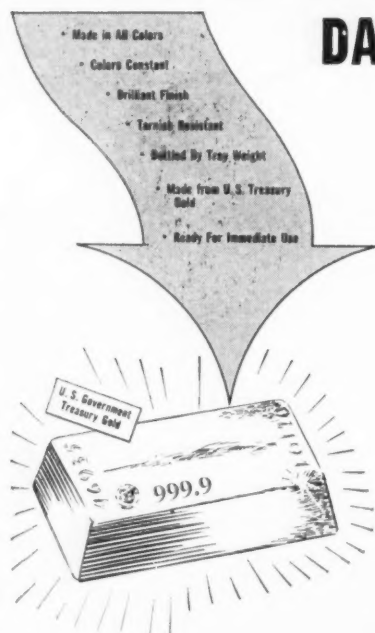
Hydrochloric acid has been conveyed in this installation for well over seven years. Service has been eminently satisfactory.



Saran lined pipe is used here in an automatic water de-ionizer. This installation has also had a long record of uninterrupted service.

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DOW



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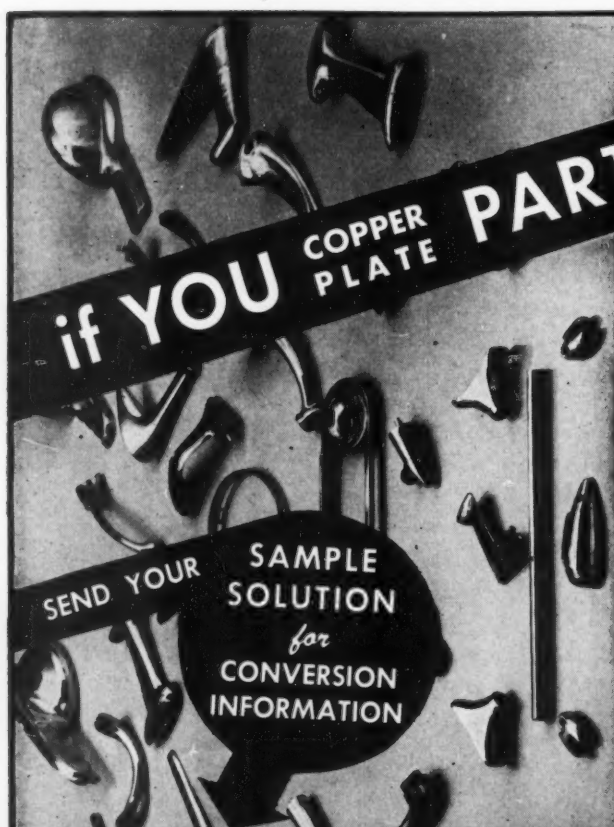


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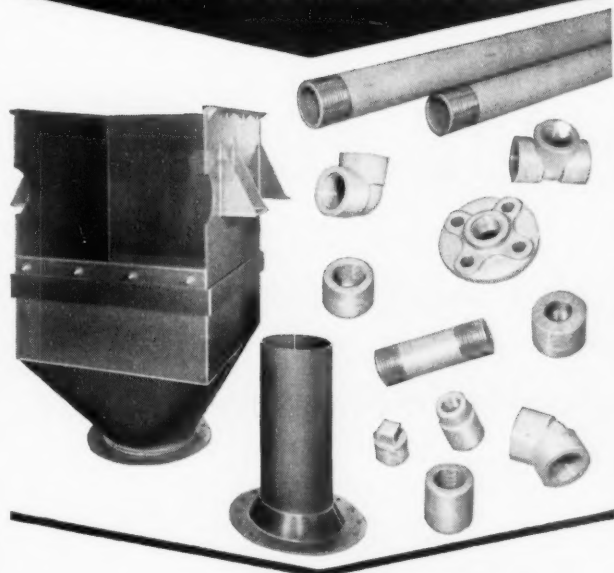
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**PLASTIC PIPE, FITTINGS
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- ★ Half the Weight of Aluminum, with High Tensile Strength
- ★ Readily Formed, Machined, Drawn, Molded or Welded

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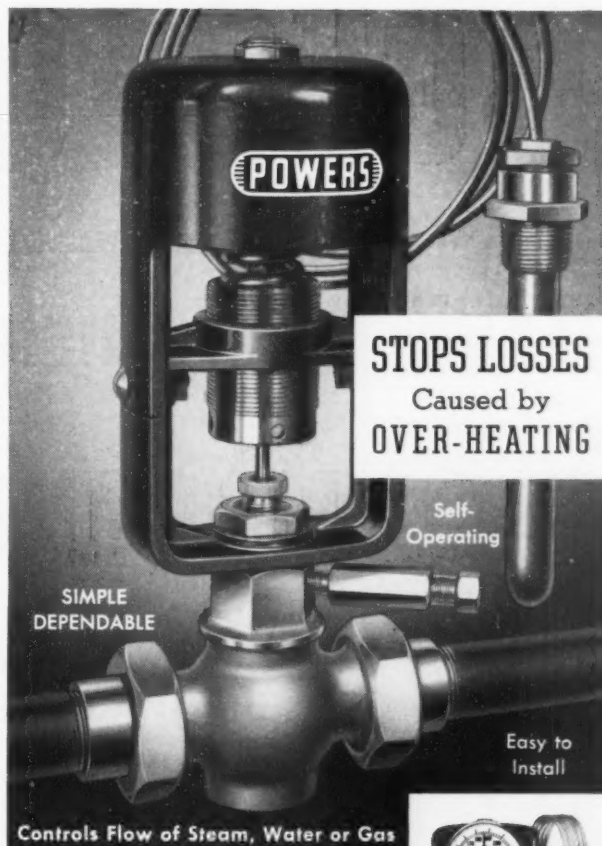
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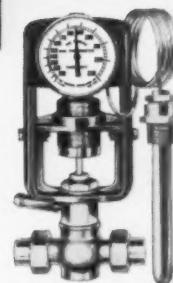


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Right type and size of valve is important for good control.

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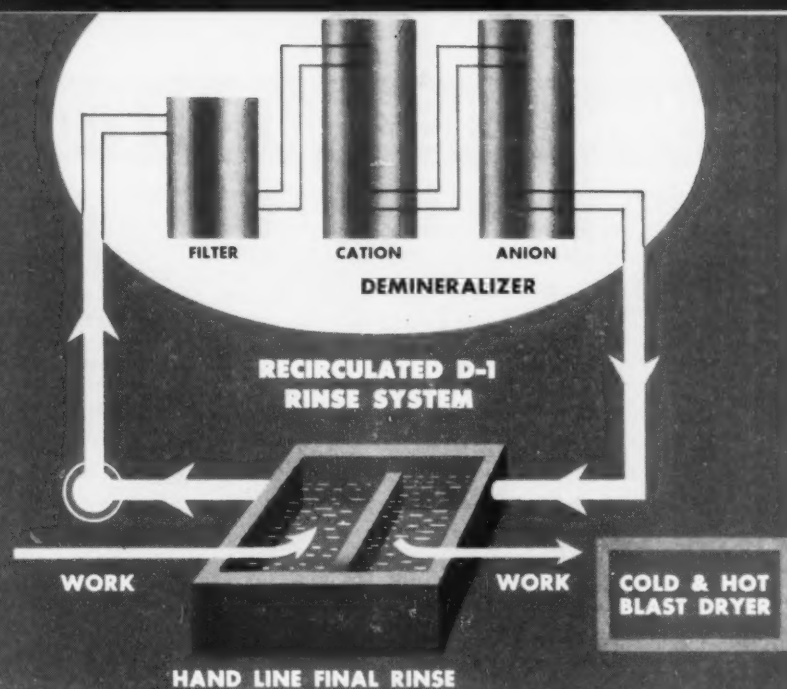
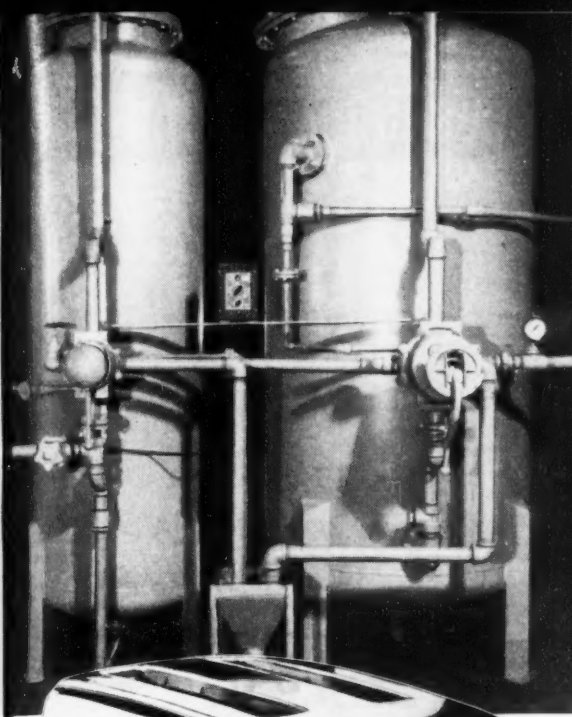
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Ion exchange unit greatly reduces final color buffing

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Write for 24-page book . . .
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. . . covers major problems and their solutions, including 6 case histories detailed with costs.

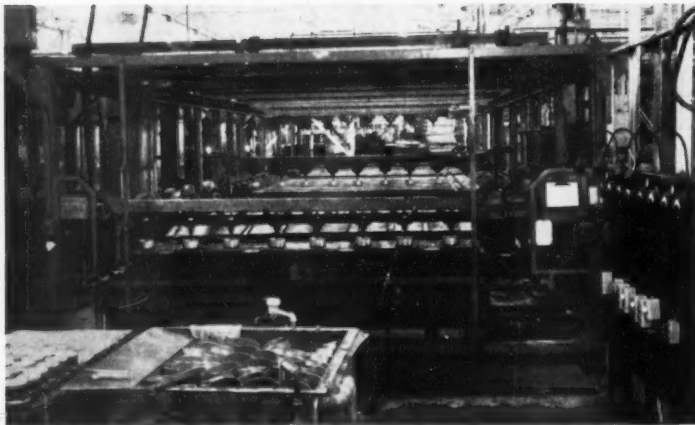
CENTRIFUGAL PUMPS • PRESSURE FILTERS • ION AND HEAT EXCHANGERS • RUBBER LININGS • WASTE TREATING EQUIPMENT

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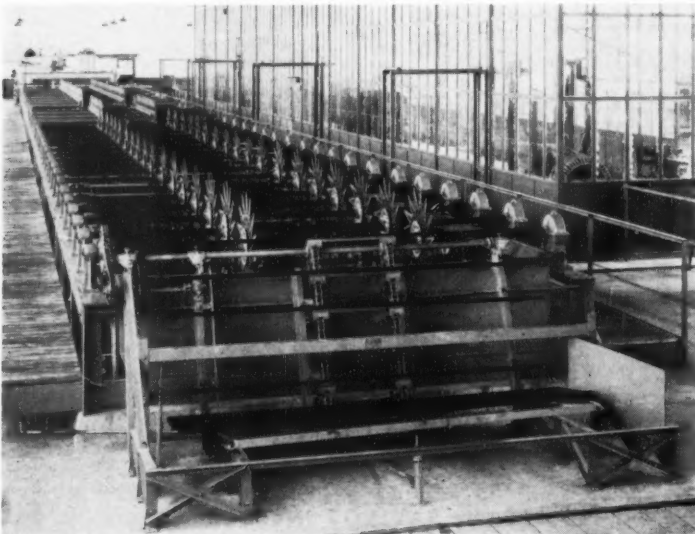
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New High Standards in Plating • Processing • Cleaning

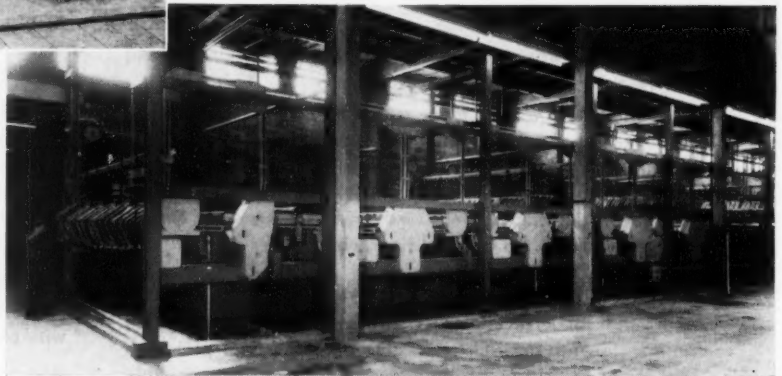


U.S. Fully Automatic Equipment for processing and heavy copper plating the bottoms of popular brand stainless steel cooking utensils. 10 such U.S. installations are in service in 3 plants of this manufacturer.



U.S. Fully Automatic Conduit Pipe Processing Installation. Performs 24 operations in one continuous cycle including cleaning, acid treatment, zinc plating pipe exterior, enamelling and baking interior surface. Capacity—over 60 million feet of pipe per year. Glass enclosure houses U.S. Generator Equipment.

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U.S. Equipment leads where production problems call for ingenious engineering and design for improving quality and lowering costs. Whether your job calls for Electroplating, Electrochemical Treatment, Metal Cleaning, Pickling, Acid Dipping, Drying or other related operations in any required series or combination—intermittent or continuous—it will pay to get U.S. recommendations. Our Service Department is at your disposal, without obligation.

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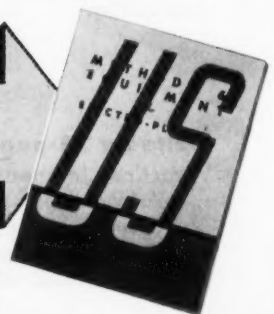
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TO
METALLIC SURFACE
TREATMENTS

AUGUST, 1955

Volume 53 Number 8

FEATURES

Editorial — New Name - Old Story	41
Finishing Exposition and Convention Held in Cleveland	42
Great Flexibility a Feature of New Automatic Plater	45
By Nathaniel Hall	
Report of the Annual Conference of the Institute of Metal Finishing	49
By Robert Pinner	
Electrodeposition of Nickel from Fluoborate Solutions	53
By Dr. C. B. F. Young and William Strobach	
Electroless Nickel Deposition	59
By Fred Pearlstein	
Science for Electroplaters — Part VI	62
By L. Serota	

DEPARTMENTS

Shop Problems	65	New Books	88
Patents	67	Business Items	89
Abstracts	73	Manufacturers' Literature	96
Recent Developments	77	News from California	100
Associations and Societies		103	

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THE FINISHING TOUCH

WATCH YOUR WASTE LINE



by A. B. Hofer

Vice-President, Frederic B. Stevens, Inc.

The "waste line" we are talking about runs from your plating, anodizing and similar processing tanks. It carries a surprising portion of the chemicals for which you have paid good money literally down the drain.

A Stevens survey for one company showed that 85 percent of the chromium used in their plating department disappeared in this manner . . . It cost six dollars' worth of chromium to put one dollar's worth on the finished product.

Well, what's the answer? We at Stevens, with our experience in the metal finishing field, decided that disposal of unwanted wastes and conservation of water and chemicals was a problem we could solve for you.



Amazing results have been accomplished by multiple reclaim tanks that produce 50 to 80 percent savings. As much as 95 percent saving in rinse water has resulted from multiple rinse tanks.

Consequently, Stevens pioneered again and have completed engineering and installation of



This waste disposal unit treats chromium and cyanide plating solutions.

numerous successful cost-saving waste treatment systems for industry.

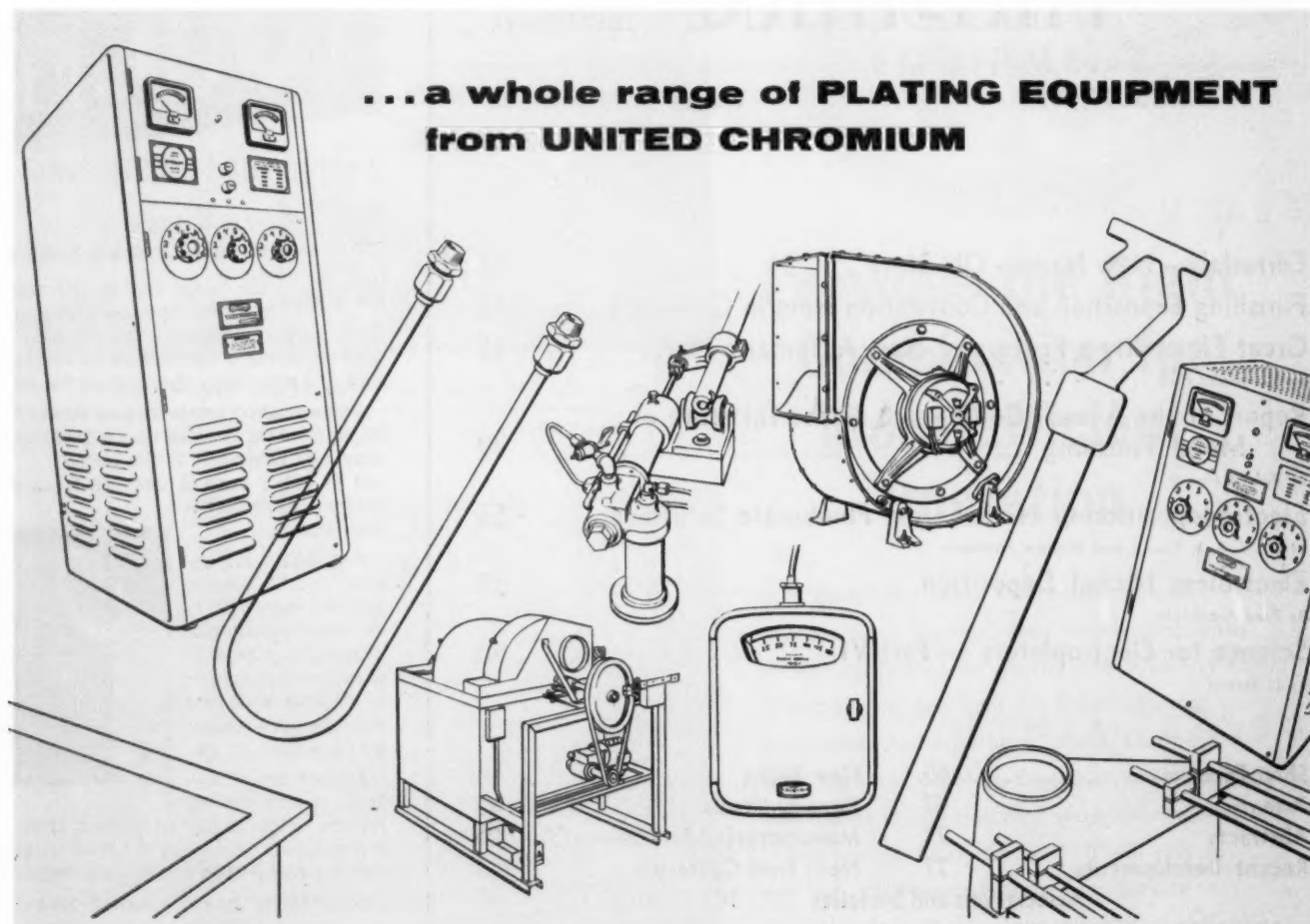
The Stevens Ion-Exchange system, too, has solved many plating and anodizing waste control problems. It also saves for reuse nature's all-important gift—water.

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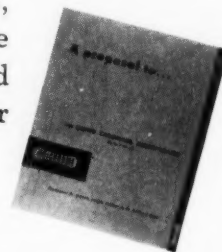
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New Name — Old Story

The *Industrial Finishing Exposition*, held concurrently with the forty-second annual convention of the *American Electroplaters' Society* in Cleveland, undoubtedly provided a number of eye-openers for many of the thousands who flocked to Public Auditorium, as it did in our case. There, set up so they could be seen and examined, were displays as small as a 3" diameter plating cylinder and as monstrous as a standard size full-automatic plating machine.

Automatic equipment of all kinds, shapes, and sizes rotated, reciprocated and gyrated with what must have been an awe-inspiring effect on visitors unfamiliar with such devices. Those who attended were well rewarded, while those who did not missed a real opportunity. It isn't our intention, however, to discuss the Exposition but to remark about a thought which came to mind as we wandered about the building, examining the exhibits and making small talk with manufacturers' representatives. The thought can be expressed in one word — *Automation*.

To anyone reading the daily press and the trade magazines, this word has been appearing lately with immoderate frequency; accepted by management as a radically original method for reducing ever-increasing labor costs; considered by labor to be a dirty word. Reams of copy have been written and published, pro and con, as if a new Industrial Revolution was dawning. Yet, sober reflection leads only to the inescapable conclusion that a new word has been coined only to describe automatic equipment, which is nothing new at all.

The plating barrels we saw in operation are obvious automatic labor saving devices, yet the first patent dates back to 1896 when the Electrolytic Plating Apparatus Co. put a successful unit on the market. The full-automatic plating machines set up on the auditorium floor fit the term "automation" perfectly. But what is new about a machine which goes back almost 50 years in the patent literature and which has been produced in many commercial variations for about 35 years?

If all this is not "automation," we don't know what is. Centuries ago someone said that the more things change, the more they remain the same. How true!

Nathaniel Hall



Clyde Kelly
Supreme President



Herberth E. Head
Third Vice-President



George Wagner
Honorary Member

Finishing Exposition and Convention Held in Cleveland

THE fourth and biggest finishing exposition is history now. Those who saw it carried away their own impressions, and to those who missed it,

we can best refer them to our June issue which carried the story on what was shown. *Nathaniel Hall's* editorial in this issue tells of his reaction and

is commended to your reading, if you missed it.

Registration for the A.E.S. Convention (blue badges) totaled 1,556 which is very high considering that exposition visitors (green badges) were allowed to attend the educational sessions without charge. A great deal of credit is due to *Eugene L. Coombs*, General Chairman, for the general success of both exposition and convention. *Leon Westbrook* served as chairman of the exposition committee under Coombs and *Charles F. Ott* was co-chairman. All technical sessions were held in the Public Auditorium.

Social events were scattered over Cleveland's downtown hotels, beginning with a Sunday evening *Get-together Party* at the Statler. Monday evening found a capacity crowd at the Carter enjoying *Open House*, sponsored by the *Metal Finishing Suppliers' Association*. On Tuesday evening nothing was scheduled, since the exposition was open; however, evening attendance did not come up to expectation. Wednesday the Statler ballroom was packed for a floor show and dance, while on Thursday the closing banquet was held at the Carter, the Cleveland hotel with the largest banquet facilities. All the events were extremely well attended.



Presentation of the Paper Awards by Supreme President Dr. Ralph A. Schaefer. Recipients shown in the front row are from left to right: G. Bittrich, R. A. Ehrhardt, V. P. McConnell, A. S. Kohler, E. J. Seyb. On the far right is Dr. Ralph A. Schaefer and in the back is B. C. Case, Chairman, Paper Awards Committee. Other Paper Award winners not present are: Ralph F. Muraca, winner of the Carl E. Heussner award, and K. G. Compton, J. E. Stareck and A. C. Tulumello.



Technical Sessions being held in the lower level, Public Auditorium, concurrently with Industrial Finishing Exposition.

The ladies had an excellent program under the direction of *Mrs. A. R. Hoffman*. *Dr. R. B. Saltonstall*, Udylyte Corporation, talked to the group at luncheon on Wednesday, while on the previous day they had enjoyed the "Aunt Ella" Luncheon, sponsored by *Dave Clarin* of Oakite Products, Inc. Thursday *Mrs. Joan T. Wiarda* of METAL FINISHING was hostess at the *Plato Party*.

The MFSA Annual Golf Tournament attracted over one hundred golfers and was the largest ever staged. *Joseph J. Duffy, Jr.* of the Pennsylvania Salt Manufacturing Company was chairman of this committee and he was assisted by *Robert Renton* of the R. W. Renton Company and *Steve Palisin* of the Empire Plating Company, Cleveland, who made the arrangements for the use of the Sleepy Hollow Country Club.

The winners were:

Low Gross, 77 — *Rudy Skriletz*, Elnor Co., Marysville, Ohio.

Low Net — tie between *Lew Doughty*, Lea Mfg. Co., Waterbury, Conn. and *Gene Brost*, Cowles Chemical Co., Skaneateles, New York.

2nd low gross, 78 — *Roger Lindway*, Precision Plating, Akron, Ohio.

2nd low net, 70 — *Wally Ivers*, Plating Co., Detroit, Michigan.

3rd low net, 71 — *Hank Holbert*, Easy Washer Corp., Syracuse, N. Y.

Lowest number of putts, 27 — *Sig Bart*, Bart-Messing Co., Belleville, N. J.

Next year's A.E.S. Convention will be held at the Hotel Statler, 16th and K Streets, Washington, D. C., the third week of June. The general chairman is *Arthur Pierdon*, c/o Art Metal Finishing Company, 12 L Street, S. E., Washington 3, D. C. Tentative plans call for A.E.S. branch exhibits of plated finishes but no commercial exhibits, a visit to the Bureau of Standards and possibly other government agencies, and an excursion to Mount Vernon. As further plans are made, they will be announced in subsequent issues.

Future conventions will be held as follows: 1957 — Montreal, 1958 — Cincinnati, 1959 — Detroit (with exhibits), and tentatively, 1960 in Los Angeles.

Acknowledgement is made to *Richard Morrison*, editor of the H-VW-M official Convention News, for the use of pictures in this article.

A.E.S. Elections

The annual business meeting of the A.E.S. was held, like the technical sessions, in the lower level of the Public Auditorium. President *Dr. Ralph*



Capacity crowd enjoying Open House at the Hotel Carter Monday evening.



Early arrivals in the lobby of the Hotel Statler Sunday evening.



Scene at one of the Ladies' Luncheons.



Metal Finishing Suppliers' Association Board of Directors meeting. From left to right: T. A. Trumbour, Treasurer, with Metal Finishing; Manson Glover, President, with Glover Coating Company; August P. Munning, Secretary, with Munning & Munning, Inc. Standing 1. to r. — George Stutz, Trustee, with Stutz Manufacturing Co.; M. M. Beckwith, Second Vice-President, with Harshaw Chemical Co.; Ray F. Ledford, Trustee, with Industrial Filter & Pump Mfg. Co.; Herman Struckhoff, newly elected President, with Lasalco, Inc.; Joseph J. Duffy, First Vice-President, with Pennsylvania Salt Mfg. Co.; W. D. MacDermid, Trustee, with MacDermid Sales & Equipment Corporation; H. E. Nice, Chairman of Nickel Committee, with Harshaw Chemical Co.

A. Schaefer, presided. The calling of the roll and seating of the delegates took 55 minutes because of difficulties in the credentials of the delegates from the Hamilton Branch and the various proxies of other branches. The following past presidents were present: George Wagner, Walter L. Pinner, Ellsworth Candee, Ed Musick, Sam Johnston, Arthur W. Logozzo, William J. Neil, Cleveland Nixon, Franklin J. MacStoker, George P. Swift, Frank Mesle, Maurice R. Caldwell.

Dr. Samuel Heiman, second vice-president, presented the awards for increased membership. These were won by Detroit 12% 668 members; Sydney, Australia, 15%; Wichita, 41%. The award consisted of a check for \$50.

Among resolutions passed were the following:

The A.E.S. silver medal paper award was changed in designation to the George B. Hogaboom Memorial Award.

The budget for the ensuing fiscal year was approved as submitted.

Clyde Kelly, first vice-president, spoke briefly on the subject of broadening the base for membership and increasing the scope of activities along the lines of polishing, buffing, barrel finishing and organic finishing.

Eugene L. Coombs, General Chairman of the 1955 Convention and Exposition, spoke on the innovations made this year.

Dr. Donald Foulke presented the name of George Wagner of the Newark Branch for Honorary Membership.

Dr. Earl J. Serfass was presented with an award of merit for his activities on the Research Committee.

In a closely contested election for 3rd vice-president, Herberth Head of the Briggs Body Division, Chrysler Corporation, Detroit, was elected over Ralph D. Wysong of the Studebaker Corporation by a vote of 77-64.

The selection of Los Angeles as a site for the 1960 convention was discussed but no decision made, since four years ahead is the presently authorized period for such selection.

M.F.S.A. Activities

The Metal Finishing Suppliers' Association held a breakfast meeting at the Hotel Hollenden on Tuesday, June 21 to elect officers and discuss matters

(Continued on page 64)

Fig. 1. View of automatic nickel and chromium plater from loading end. Machine is 140' long, 20' wide and 18' high. Million pound weight is supported on reinforced piers.



Great Flexibility a Feature of New Automatic Plater

By Nathaniel Hall, Technical Editor

ONE of the largest full-automatic plating machines ever installed by a job plater was recently put into operation at the plant of *Alberts Plating Works, Inc., of Brooklyn, N. Y.* With a total length of 140 feet and a width of 18 feet, the new machine conveys racks along five parallel processing lanes, each of which can plate different kinds of articles, and performs twenty-two operations between loading and unloading stations, yet was so cleverly designed that the whole mechanism with its mile of chain is driven by a single five horsepower motor with variable speed drive.

A new steel frame building enclosed by brick and cinderblock, 160' x 100' x 22' high was designed expressly to house the equipment, which has a maximum height of 18 feet. The high water table at the site and a concentrated weight of one million pounds when filled with solutions and anodes necessitated the sinking of piles to support the building and a floating foundation to support the machine, which rests on reinforced concrete piers, levelled and asphalt coated. The floor is pitched toward a 12" wide trough, neoprene lined, and extending the full length of the machine.

Two lined sumps, 4' x 4' x 3' deep, with baffle partitions, produce up- and downflow through limestone for neutralization of acid wastes, no other effluent treatment being required by municipal authorities.

For a number of years, a division of the company has manufactured large quantities of fabricated chromium plated tubing for the furniture and allied industries. The automatic machine was installed with the intention of serving the division's anticipated requirements and leaving open capacity for accepting large job plating contracts. Not only has this been accomplished, but the man-hour requirements have also been drastically reduced. Four men now plate twice as many furniture components in a single shift as were plated in two shifts, each having fourteen men.

Formed tubes are loaded ten on a rack, the machine's capacity being 125 racks, and the complete cycle requiring 45 minutes. The racks have been designed for maximum adaptability to different shapes and an unloaded weight of 100 lbs. each testifies to their sturdiness. Since the racks return over the top of the machine, loading and unloading can be performed at

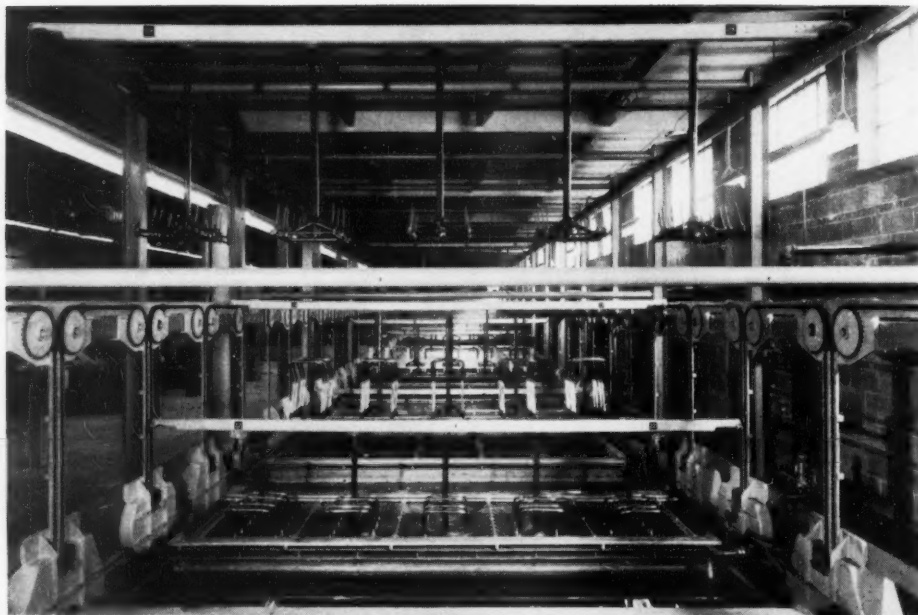


Fig. 2. Photo taken from unloading station, showing drying oven in foreground and empty racks returning overhead to loading station at far end. Meters and generator controls are mounted on wall at right.

Fig. 3. Loading station. Exhaust duct from first cleaner can be seen extending under catwalk and through wall at left.

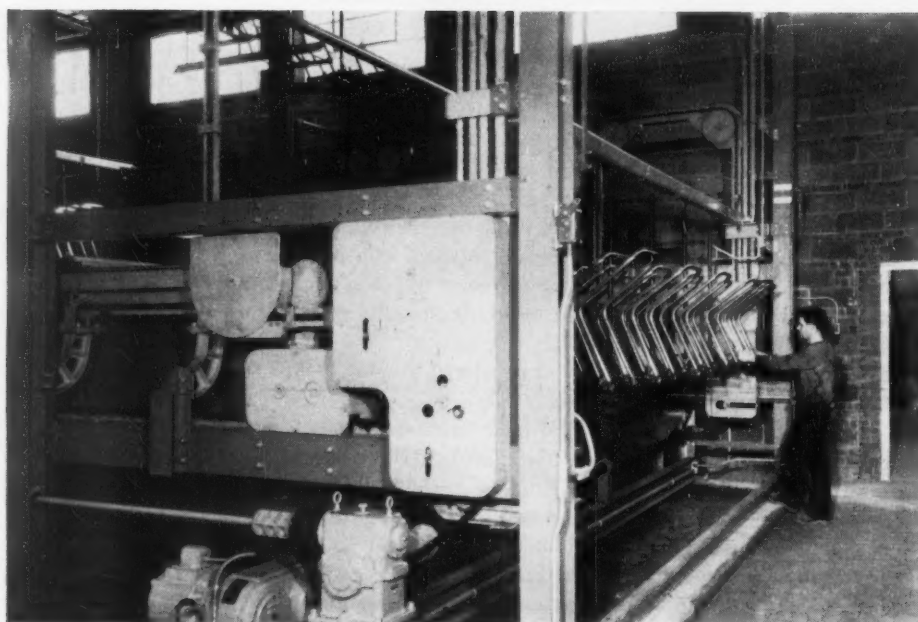
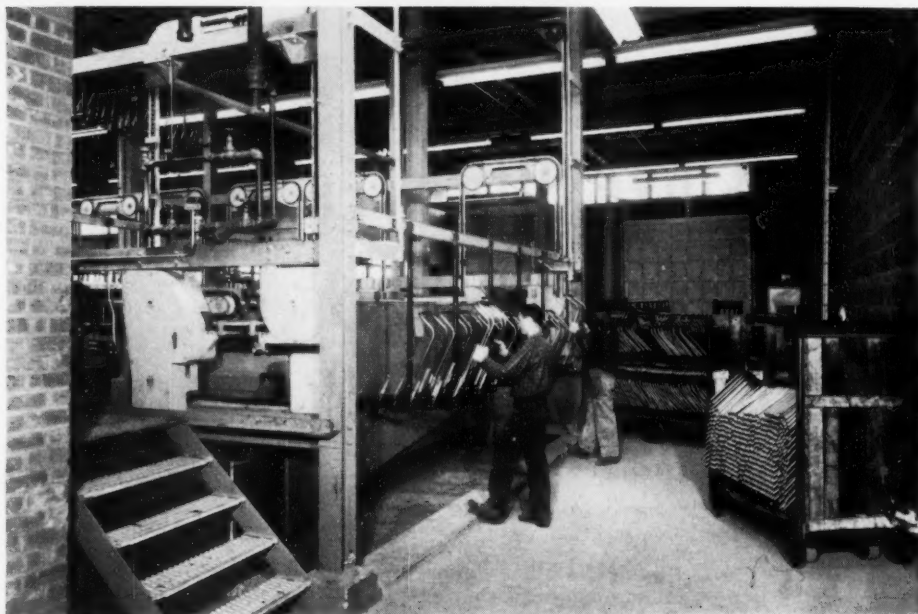


Fig. 4. Unloading station. The 140' machine with its mile of chain is driven by the single 5 HP motor seen in the foreground with its variable speed drive.

Fig. 5. Generator and blower room is separated from plating room by brick wall through which bus bars and ducts extend. Motor controls can be seen on wall, but D.C. controls and meters are mounted on opposite side for ready access.

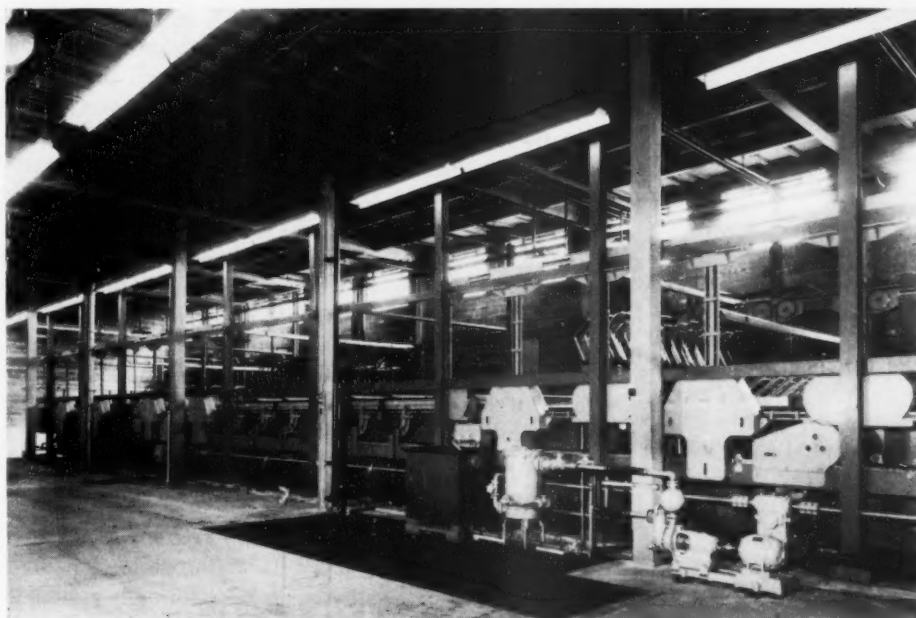
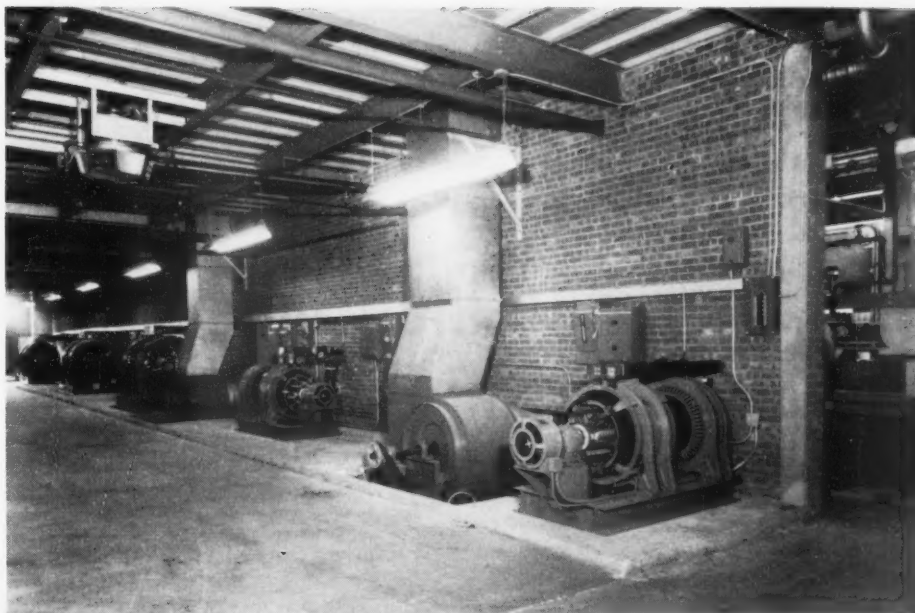


Fig. 6. Tank in which nickel solution is reheated and replenished is set in sump covered by steel grating. In center are filter precoat slurry tank, rubber-lined filter and water-lubricated centrifugal pump.

Fig. 7. Same view as Fig. 6, showing sump and reinforced concrete piers before installation of equipment. Drain trough between sump and piers was later lined with neoprene.



either end but, at present, these operations are performed at opposite ends, which simplifies the feeding of raw stock and the removal of plated tubing from the department. A thickness of 0.0005" bright nickel is applied in 15 minutes and 0.00001-2" chromium in 2½ minutes. The complete cycle is as follows:

1. Load.
2. Anodic clean, 2 stations.
3. Hot rinse, 1 station.
4. Acid dip, 2 stations.
5. Cold rinse and spray, 1 station.
6. Anodic clean or copper flash, 2 stations.
7. Cold rinse and spray, 1 station.
8. Acid dip, 1 station.
9. Cold rinse and spray, 1 station.
10. Cold rinse and spray, 1 station.
11. Nickel plate, 7 stations.
12. Cold rinse and spray, 1 station.
13. Alkaline activator, 1 station.
14. Cold rinse and spray, 1 station.
15. Acid dip, 1 station.
16. Cold rinse and spray, 1 station.
17. Chromium plate, 2 stations.
18. Cold rinse and spray, 1 station.
19. Cold rinse and spray, 1 station.
20. Hot rinse, 1 station.
21. Drying oven, 2 stations.
22. Unload.

All tanks are 168" wide by 52" deep, the single stations holding 2,000 gallons, the double station cleaners, acid, and chromium 4,000 gallons, and the nickel tank having a capacity of 12,000 gallons. Three separate exhaust systems are employed, one of 20,000 c.f.m. for the first anodic cleaner and its adjacent hot rinse, one of 15,000 c.f.m. for the second cleaner and alkaline activator, and the third of 20,000 c.f.m. capacity for the chromium tank and final hot rinse.

A wall runs the full length of the building, parallel to the machine. The exhaust blowers with their motor drives and controls are set in the room back of this wall, through which the ducts extend to the tanks. In this room are also located the generating equipment, consisting of slow-speed, synchronous driven motor-generator sets, 15,000 amp./6 v. feeding the nickel tank, 7,000 amp./6 v. for the chromium, 1,000 amp./6 v. for the alkaline activator, and two 3,000 amp./9 v. for the two cleaners. The machines are so positioned that there is a minimum run of bus bar through the wall and under the catwalk of the tanks. Controls are set on the plating room side of the wall for convenience, as are the recording charts for the automatic solution temperature controllers. Electrical service to the building consists of a 3,000 ampere main supplying 3 phase, 208 volts.

Heat is supplied by a 350 HP boiler, burning #6 oil, and equipped with a condensate return system in an adjacent sump. A pH meter is set to control valves to divert the flow to the sewer should leakage in any of the tank heating coils result in contamination of the returned condensate. The water supply is of exceptionally high purity so that deionization is not required, but process water is conducted from the main to the tanks through aluminum piping, reducing maintenance. Rinsing sprays are set in stainless steel

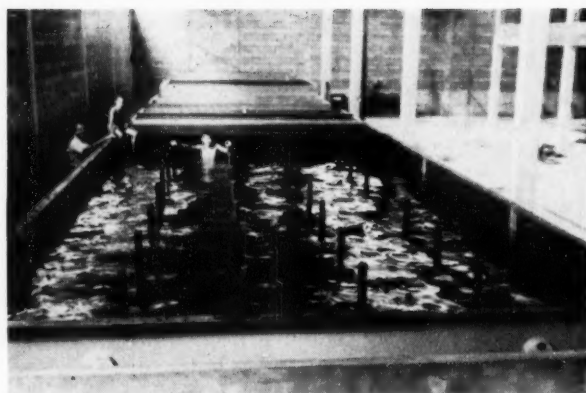


Fig. 8. Nickel tank being tested with water for possible leakage during early stage of erection of machine and superstructure. Local small fry are shown taking advantage of recreational opportunities. Posts visible in nickel tank are supports for anode rods.

headers to withstand solution drippage and are controlled by delayed timers on the conveyor mechanism operating solenoid valves so that no water is used except during the rinsing period. A set of fog nozzles is mounted along the last 4' of the nickel tank so that dragout of solution will be minimized. The water introduced into the tank by these nozzles is expected to just satisfy the evaporation losses from the solution.

All tanks operated at elevated temperature are heated with steam coils except the nickel tank. Nickel solution is continuously withdrawn from an overflow dam at one end of the plating tank, through rubber-lined steel pipe into a covered 2,500 gallon rubber-lined steel tank set below floor level in a concrete sump. An automatic sump pump has been installed to take care of possible flooding. The storage tank is heated with lead coils and mounts an agitator in an opening of the cover, through which additions of replenishing chemicals and brighteners are made, as indicated by chemical analysis.

The solution is pumped from the storage tank at the rate of 5,000 gallons per hour through a rubber-lined filter set on the floor above the sump tank, alongside a filter precoat slurry tank. The reheated and filtered solution is then returned through a connection at the side of the plating tank opposite from the take-off dam, and near the bottom, whence a 14' lead header pipe, 1½" I.D. with holes drilled at intervals, distributes the solution along the length of the plating tank.

All solutions are analyzed regularly in a completely equipped laboratory and are maintained at the optimum concentrations. Alberts Plating Works is operated by Gerald and Alfred D'Agostino, two well-known members of the job plating fraternity, the latter presently serving as chairman of the executive committee of the *Masters' Electro-Plating Association*. Good housekeeping is a byword here since both men are technically trained and acutely aware of the necessity for attention to details which spell the difference between profitable operation and losses in the highly competitive job plating business.

Report of the Annual Conference of the Institute of Metal Finishing

Reported by Robert Pinner, Surrey, Eng.

THE 1955 Annual Conference of the British Institute of Metal Finishing was held at Torquay on the South Coast of England from May 17th to 21st and was attended by over 300 delegates.

Taken as a whole, the 1955 Conference represents the present trends in British metal finishing research. Most significant is the emphasis on physical properties of deposits and particularly on deposit stress. No less than four of the papers dealt wholly or in part with methods of determining stress and its relationship with other properties and plating variables. The paper by Williams and Hammond on chromium plating and fatigue is of particular interest and the results obtained closely corroborate experiments carried out by Dr. Sayeb. Mr. H. Fry's paper is also of note as it adds significantly to our knowledge of the structure of chromium deposits.

Meanwhile progress has been reported with three new processes. Significantly, two of these are alloy plating processes. Of considerable interest here is the iron-zinc alloy coating developed by the *British Iron and Steel Research Assn.* This process is not yet in production but both the zinc-rich and iron-rich deposits obtained from this bath have shown remarkable properties either as a protective or as a decorative finish on steel.

The other two new processes, the tungsten alloy plating process developed at Cambridge University, and the black coloring of copper by anodic oxidation are perhaps of more specialized interest.

The following are short abstracts from the papers presented at the Conference.

THE EFFECT OF CHROMIUM PLATING ON THE FATIGUE STRENGTH OF STEEL

by C. Williams and R. A. F. Hammond (Armament Research Establishment, Woolwich).

The effect of chromium plating on fatigue strength is of particular importance where steel is hard chromium plated for engineering applications, e.g. on aircraft components. Previous work on this subject has suggested that heat-treatment after plating could remedy the lowering of fatigue resistance caused by

plating. The present work was carried out on Ni/Cr/Mo steel test pieces which were trichlorethylene degreased, electropolished in sulphuric-phosphoric acid solution, plated with 1, 6 and 12 mil chromium deposits and heat treated at up to 620° C. Subsequent internal stress and fatigue tests indicated that in steels of U.T.S. 65 and 80 tons/in.² the fatigue limit after chromium plating is independent of the hardness of the steel, i.e. the loss is higher in the stronger steels.

A direct relationship (probably linear) was found between residual stress in the chromium and the percentage loss in fatigue limit and it was concluded that fatigue failure is governed both by the deposit stress and the intrinsic strength of the deposit (approximately 20-25 tons/in.²).

The loss in fatigue strength after heat-treatment is higher for thicker deposits. 'As plated,' the fatigue strength is more or less independent of deposit thickness. Heat treatment at 200-300° C. causes further reduction in fatigue strength but this is restored at 440° C., and, at 520° C., the original fatigue limit or even higher is obtained.

In practice, heat-treatment after hard chromium plating should be carried out at above 440° C. If the resulting softening of the deposit (about 650 D.P.N.) is not desirable or the mechanical properties of the steel is impaired, it is better to omit heat-treatment entirely unless the steel is particularly subject to hydrogen embrittlement.

Of particular significance was also the low stress and negligible reduction in fatigue limit, obtained with the normal 250 g./l. chromic acid-sulphate bath using 200 amp./ft.² at 40° C.

A STUDY OF CRACKING IN CHROMIUM DEPOSITS

by H. Frey (British Non-Ferrous Metals Research Assn.).

The crack-structure of chromium deposited from the normal chromic acid-sulphate solution is of fundamental importance and many workers have investigated the relationship between cracking and the operating conditions. In this paper, experiments were described which led to the following conclusions: (1) striations running parallel to the basis metal, and

found in cross section, and associated with cracking. As the plating temperature is increased, the striation becomes wider, the crack depth increases and their number decreases. At above 75° C. both cracks and striations disappear. (2) In uncracked deposits, stress is independent of or decreases with increasing deposit thickness. This contradicts previous theories that cracking is due to increasing stress with increasing thickness until the tensile strength of the deposit is exceeded. (3) Isolated cracks occur before general cracking sets in. (4) the deposit thickness at which general cracking occurs is also approximately that where the first striations are formed and mean stress begins to decrease rapidly. A tentative theory is advanced that striations in the chromium deposit are due to the inclusion of foreign material by adsorption in certain crystal planes on which cracking may start due to low tensile strength.

A NEW METHOD OF ANALYZING STRESSES ON ELECTRO-DEPOSITS FROM THE CURVATURE OF A PLATED STRIP by Dr. J. J. Pick (Birmingham University).

This paper presented a theoretical discussion of stresses and strains in electrodeposits based on the assumption that stress is due to dimensional changes subsequent to deposition. The changes are expressed in terms of 'linear free strain' (e_x) defined as the strain which a deposit would undergo parallel to the base if it were deposited on an infinitely thin base of no mechanical strength. This parameter therefore measures the macro-strains in the plane of the surface of the deposit and is expressed by

$$e_x = \frac{dp}{dx} \cdot \frac{(t+x)^2}{6}$$

where x is the deposit thickness and p the change in curvature of a strip of thickness, coated on one side only, Young's modulus of base and the deposit being the same. This and a second formula for the case where the moduli are different apply only when the dimensional changes in the deposit take place rapidly compared with the rate of deposition. In illustration the author quoted experiments on the influence of crystallographic orientation and pretreatment on the strain and stresses in copper.

CORROSION TESTS OF TIN-CADMIUM ALLOY COATINGS by S. C. Britton and R. W. de Vere Stacpoole (Tin Research Institute).

Previous work on tin-cadmium alloy coatings has been carried out in the U.S.A. and Gt. Britain, both with heat treated layers of the single metals and with alloy electrodeposits from the fluoborate (U.S.A.) and sulphate and fluosilicate solution (Gt. Britain), solutions. In this paper the authors reported on the corrosion behaviour of the electrodeposited alloy coatings on steel. It was found that, though the coatings have outstanding salt spray resistance, their properties were not quite as good under service conditions. The conclusions were summarized as follows. Coatings with tin contents up to 50% are approximately equivalent to cadmium in marine atmospheres or in sea-water im-

mersions. In inland exposures the coatings are generally inferior to cadmium but are superior in their resistance to organic vapors such as are given off by some insulating materials.

Heat-treated composition coatings of tin with zinc or cadmium show no advantage over either zinc or cadmium of the same total thickness alone, except in marine conditions, where a 0.5 mil tin under- or top-coating was beneficial to a zinc deposit.

IRON-ZINC ALLOY DEPOSITION

by Dr. F. Salt (British Iron and Steel Research Association).

In this, the first full report of a new iron-zinc alloy electrodeposition process developed at the British Iron and Steel Research Association, the authors gave the conditions for depositing alloys containing 3-90% zinc from sulphate solutions.

Two solutions were mainly found suitable:

1. Ferrous sulphate (cryst.) 248 g./l.; zinc sulphate (cryst.) 8.8; ammonium sulphate 118; potassium chloride 10; citric acid 0.5; Teepol —; current density 200 amp./ft.²; alloy composition 6% zinc; hardness 560 D.P.N.; 2. Ferrous sulphate (cryst.) 174 g./l.; zinc sulphate (cryst.) 886 ammonium sulphate 118; potassium chloride 10; citric acid 0.5; Teepol. 0.4 ml./l.; current density 180 amp./ft.²; alloy composition 60% zinc; hardness 350 D.P.N.

Both solutions were operated at pH 1.7 and 50° C. though plating at 80° C. is often to be recommended to avoid pitting.

Alloy coatings containing 30-90% zinc have better corrosion resistance than pure zinc and may be effective as a base for paint coatings on steel, as they would offer sacrificial protection while not reacting as readily as zinc with the paint. Alloys of about 60% zinc which can be plated bright, could be used as an indoor decorative finish. Particularly attractive are the high speed of deposition, 1 mil in 8 min., combined with the good smoothing action and high deposit hardness. Corrosion tests are under way designed to test the alloys and a substitute for nickel-chromium. The low zinc content alloys can be produced fully bright, but have inferior corrosion properties. Separate zinc and iron anodes are used.

COBALT-TUNGSTEN ALLOY DISPOSITION

by Dr. T. P. Hoar (Cambridge University).

Several investigators have studied the deposition of tungsten and tungsten alloys for their excellent corrosion and hardness, particularly at high temperatures. Among the most promising solutions were the citric acid base solutions of Brenner, Burkhead and Seegiller [Proc. 3rd. Int. Conf. Electrodeposition, London, 131 (1948) and Clark and Holt [Trans. Electrochem. Soc., 94, 244 (1948)].

The present author found the best results to be obtained with a solution containing tungsten (as sodium tungstate) 40-70 g./l.; cobalt (as cobalt sulphate) 4-12; citric acid 70-150; ammonium chloride 50.

The solution is adjusted to pH 7.5-8.5 with sodium hydroxide and operated at 50-75° C. and 5-20

amp./dm.² using pulsed current of 0.05-2 sec. with equal or longer 'off' periods. The current efficiency is approximately 21% and the deposit contains up to 60-66% tungsten. From the theoretical point of view the experiments proved that hydrogen overvoltage in these solutions was less on the alloy than on tungsten or cobalt, indicating that the electronic structure of the alloy cathode probably is probably more favorable for hydrogen deposition and also for tungsten deposition.

THE MECHANISM OF CHEMICAL POLISHING

by Dr. A. Hickling (Liverpool University).

This theoretical paper dealt with the theory of a process developed by W. A. Marshall [J. Electrodepos. Tech. Soc., **28**, 27 (1952)]. The authors investigated (a) the potential of the metal, (b) its dissolution rate and (c) the effect on the surface, under various conditions, using two grades of mild steel. The results showed the region where polishing is a clearly defined range of H₂O₂ concentration, in which the potential and the rate of dissolution fluctuated. The effect of the operating conditions and addition agents on the dissolution rate and the fluctuations, led to the conclusion that the metal is partly covered by oxide in the polishing range and that dissolution is electrochemical and due to local cell between the oxide covered hollow to bare metal peaks. [R. Pinner, *Electroplating*, 360, 401, 444 (1953); 127 (1954)].

THE ELECTROLYTIC OXIDATION OF COPPER AND COPPER ALLOYS IN HOT ALKALINE SOLUTION

by Dr. S. G. Clarke and J. F. Andrew (Armament Research Establishment, Woolwich).

Anodic oxidation of copper in sodium hydroxide solution was first investigated by E. Muller [Z. Electrochem., **13**, 133 (1907)] and then applied on a larger scale by Lyapunboon and Barashenkoon [J. Appl. Chem. U.S.S.R., **12**, 26 (1939)], and Maclean and Young [Metal Finishing, **43**, 247 (1945)]. In the investigation of these processes, Clarke and Andrew found that a solution of 15% sodium hydroxide and containing 0.1% sodium or ammonium molybdate gave good results at 85° C. and 15 amp./ft.² for 3-4 min. The solution is used in a steel tank which is the cathode and, before anodic oxidation, the work is degreased and lightly pickled for 1-2 min. in a solution containing sodium dichromate 200 g./l. plus sulphuric acid 40 ml./l. to remove existing oxide, after which it is rinsed, dipped in 25% hydrochloric acid and rinsed again before anodic oxidation. During treatment, the film grows through brown to black. On 70:30 brass three processes are used (a) treatment as above at 10 amp./ft.² for 10 min., (b) initial treatment at 5 amp./ft.² for 5 min. followed by 10 amp./ft.² for 2½ min. or (c) the following sequence at 90-100° C.: 45 sec. at 2 amp./ft.², 90 sec. at 4 amp./ft.², 135 sec. at 6 amp./ft.², 180 sec. at 8 amp./ft.², 225 sec. at 10 amp./ft.². The deepest black is obtained by (b) and (c). Process (b) also works on a copper-6% aluminum alloy, while 5 amp./ft.² for 5 min. gives good results on copper-5% tin alloy.

The coating which is approx. 0.1 mil thick con-

tains roughly 60% CuO and 40% Cu₂O and has a velvety black appearance which can be brightened by rubbing. The adhesion is good and the anodized work will withstand bending and 200° C. The coating has good indoor corrosion resistance.

THE STRUCTURE AND GROWTH OF ELECTRODEPOSITS

by Dr. H. Wilman (Imperial College of Science and Technology).

This paper reported on recent work carried out into growth of electrodeposits. Of particular interest was the conclusion on electron diffraction evidence that, during electrodeposition, the surface reaches a temperature as high as 600° C. or more due to heat liberated by ion discharge. The conditions of electrodeposition are thus very similar to those obtained in vacuum deposition, which is also reflected in the similar residual stress.

In investigating silver deposits from cyanide deposits on (110), (100) and (111) faces of electrodeposited silver single crystals the author found that, between the first stage of deposition, i.e. overgrowth parallel to the original crystal face, and the normal random polycrystalline- or one-degree oriented growth found at later stages of deposition, an intermediate stage is observed above a critical current density in which twinning of the single-crystal overgrowth occurs. This critical current density is highest on the crystal forms making the highest of atoms per unit area, and the higher the current density is raised above the critical value, the more rapidly the twinning stage is reached. In general, the critical current density increases with increasing bath temperature. Brighteners such as carbon disulphide, thiosemicarbazide, thiourea, urea and potassium thiocyanate, caused widely different effects on the crystal habit. A theory is advanced that brightening results when the crystals form surfaces which are large and smooth relative to the wavelength of light, irrespective of crystal size.

ELECTROFORMING IN ELECTRONIC ENGINEERING

by P. M. Walker, N. Bentley and L. Hall (British Thomson-Houston Co., Ltd.).

This was a practical paper dealing with the techniques for electroforming waveguides. Stainless steel or plastic mandrels are used and must be carefully prepared, the former by degreasing, hydrofluoric etching, the latter by degreasing and sensitizing in acidified stannous chloride solution and silver spraying. Subsequently the stainless steel is struck in a silver plating bath at 25 amp./ft.² for 1 min. and plated at 10-15 amp./ft.² for 20 min. while the plastic mandrels are plated for 20 min. at 10 amp./ft.² Following this, both types of mandrel are silver plated using P.R. with a cycle of 60 sec. plate: 15 sec. deplate at 25 amp./ft.², 60-70° F. with rotation of the cathode and solution agitation. Alternatively, the stainless steel mandrel may be copper plated in an acid copper bath for 1 min. at 20 amp./ft.² at 60-70° F. followed by plating at 10-15 amp./ft.² to 5 mil minimum thickness. On the plastic mandrel 15-20 mil silver or acid copper should be built up.

Subsequently both types of mandrel are rinsed and plated in a cyanide bath. For this purpose a Rochelle

type solution containing Cu 9.6 oz./gal., KCN (free) 1.2, KOH (free) 6.0, proprietary brightener 1.0 is used at 140° F. with cathode rotation and solution agitation using P.R. at 60 sec. plating; 30 sec. depleting at 70 amp./ft.² giving a rate of deposition of 2-6 mil per hour. Continuous filtration is used and a rubber lined tank is recommended. The authors also described a modified contractometer for stress determination. This is based on the Brenner and Senderoff instrument [J. Res. Nat. Bur. Standards, **42**, 89 (1949)] which has been made more sensitive for deposits of low stress such as copper and silver by carrying the helix on a single bearing and by using a mirror, lamp and scale to measure the deflection.

Tests with this instrument showed that the initial surface condition has a profound influence on the residual stress and that the use of P.R. is always favorable.

THE PLATING OF SCREW THREADS

by A. W. Wallbank and D. N. Layton (Ionic Plating Co. Ltd.).

This paper dealt with the difficulties met in barrel plating of screws and other threaded components. The authors commented on the poor quality of 'commercial plating' (in the absence of a specification) sometimes carried out on screws, and stated that a minimum of 0.1 mil should be aimed at. Wood screws and self-tapping screws are little affected in use by the deposit thickness. On metal threads on the other hand, it may be impossible to meet specifications and, at the same time, comply with the dimensional maximum.

Methods for determining the deposit thickness were reviewed. Gravimetric methods are useful if the surface area of the screws is known with fair accuracy. The Clarke gassing test is useful for cadmium. [J. Electrodepos. Tech. Soc., **22**, 1 (1947)].

Experiments on the scatter of plating thickness of barrel cadmium plated screws showed that the scatter on individual screws increased with increase in the average deposit thickness. A graph was derived showing the batch average to aim at to achieve any specified minimum thickness.

Both the plater and the manufacturer should have a tolerance on his nominal dimensions and this should be equivalent to 5-10 min. plating time or 0.05 mil in thickness on the batch average.

In plating nuts, the area of the interiors for thickness determination is often difficult. In practice, it is usually best to ignore the effect of drilling or lapping. Porosity tests on nut interiors are usually unnecessary. Routine inspection should be carried out for unplated areas, staining and deposit thickness. The plater should not be made responsible for gauging. Finally, the author suggested that specifications should lay down minimum batch average thickness which could be tested on randomly plated sample of 10 components per barrel batch.

THE ELECTRON MICROSCOPE IN THE STUDY OF PAINTS

by N. D. P. Smith (Imperial Chemical Industries Ltd. Paints Div.).

Mr. Smith's paper dealt with the applications of

electron microscopy in the study of paint materials and coatings. In using the electron microscope thin specimens which are stable to vacuum and heating are examined directly by transmitted electrons, using a thin nitrocellulose film on a perforated metal disc for support. With massive specimens, replicas are prepared. To examine the internal structure, replicas are taken of sections (in the case of metals) or paint coatings may be examined by transmission of the sections.

In the study of pigments and extenders the main applications are the determination of particle size and shape both for research and for identification of paints. Electron microscopy has also helped to solve problems in surface structure. Gloss has been shown to depend on surface smoothness and is independent of shallow undulations or scratches which are smaller than the wavelength of light. Gloss defects in high gloss paint are caused mainly by over-size pigment or extender particles.

Bloom formed in industrial or humid conditions is due to a film of ammonium sulphate which crystallizes with age. Bloom on nitrocellulose lacquers may also be due to an incompatible constituent such as castor oil which is expelled to the surface or to deposition of dew on the wet paint which causes ring craters.

The electron microscope can be used also to follow changes in the structure of paint coatings on exposure tests. Severity of chalking, which has been shown to be related to photochemical changes at the pigment surface, is probably related to the pigment dispersion and is more pronounced if the pigment is aggregated.

BLISTERING OF PAINTS ON STEEL

by A. Nicholson and H. A. H. Jenkins (Pyrene Co., Ltd.).

The authors of this paper reviewed the causes of blistering of paint films. The main cause is water absorption by the paint and this depends upon the age and composition of the film but is often between 20-50% (vol.). When immersed in solutions, the water absorption decreases with the concentration and increases with the age of the film. The expansion caused by the absorbed water is only partly reversible on drying.

Three types of blistering commonly occur:

(a) Film expansion blistering which is due to local detachment of the paint. The blisters are usually apparently empty and are relatively slow to form, fairly small (1-2 mm. diam.) and uniformly distributed over the surface. They can be partly eliminated by drying. (b) Corrosion blistering is probably the most common type. These blisters are irregular in shape and distribution and can be quite large. They occur when corrosion is quite far advanced and grow progressively until the paint film is ruptured. (c) 'Snail-track' blisters. Those are very small and grow between paint and metal, outlining an area of paint. This type of blister occurs under long storage or transport times in tropical conditions and is not associated with corrosion but is osmotic in origin. Their origin is due to deposits of foreign matter in wet processes before

(Concluded on page 58)

Electrodeposition of Nickel from Fluoborate Solutions

By C. B. F. Young, Ph.D. and William Strobach, M.Ch.E.

This is the second installment of the article by Dr. Young and Mr. Strobach. The first part appeared in our July issue.—Ed.

Tests With Very Dilute Bath

The next solution tested had the lowest metallic nickel content of any investigated, namely 50 g./l. No chloride was added and the free boric acid content, derived from the amount present in the concentrate, was about 17 g./l. The pH as prepared was 2.5. The solution was given no purification treatment at any time. The only change in composition, other than pH, was the addition of 15 g./l. more H_3BO_3 as will be discussed later.

The first two Hull cell tests were run at temperatures of 25°C. and 38°C. (mean value) respectively. Much gassing occurred at the anode in both cases and at the high current density end of the cathode, particularly at 25°C. At the latter temperature bad burning resulted at about 80 amp./sq. ft. and pitting was serious throughout the entire range.

Special attention was paid in this series of tests to noting the amount of gassing at anode and cathode and its effects on pH. The low nickel concentration and relatively low temperatures at which most of this set was run were conducive to accentuate these effects.

Also, tests were included with rotating cathodes to investigate the effect of agitation on the limiting current density. The cathode speed in RPM has been converted into surface feet per minute and the data obtained has been plotted as Figure 6. A relatively small change in either speed or current density had a profound effect on the nature of the cathode deposit when near the point at which the limiting current density was reached since at this point the conditions affecting the cathode film become quite critical. This series of tests presents a striking illustration of the applicability of one of the axioms enumerated by Bancroft, namely that if a satisfactory deposit has been obtained from a solution at any given current density a similarly satisfactory deposit can be obtained at any higher current density provided that conditions at the cathode surface are maintained constant.

In those tests where excessive burning, formation of green basic nickel salts, and low cathode efficiencies were encountered, much gassing occurred at the cathode, as expected. An increase in cell voltage accompanied these other manifestations of concentration

polarization. Also, it was necessary during this series of tests to make frequent additions of fluoboric acid to maintain the desired pH value. The pH of the solution definitely tended to increase due to the fact that the anode efficiency was undoubtedly higher than the cathode efficiency which is corroborated by the slight increase in metal content of the solution obtained during these tests.

The bulk of this work, as usual, was done with brass cathodes. However, a few tests made with steel samples showed similar results although they also indicated that the limiting current density using steel cathodes is slightly lower than for brass.

After completing the tests above outlined, a series of Hull cell plates was run to determine limiting current densities with this solution as was previously done for others. These results are plotted on Fig. 4 and fall again into practically a straight line. During the course of these tests considerable gassing at the anode occurred and it is seen that there is a definite decrease in pH, due to the low anode efficiency. Also, addition of some nickel fluoborate concentrate was necessary to maintain the desired metal concentration.

The solution was filtered after practically every test involving the use of relatively high currents with the formulation as originally prepared. Each time a quantity of fine particles having a dark purplish brown color remained on the filter. This is believed to have been a fluoride compound of nickel such as the previous study of the available literature indicated might be formed in absence of sufficient free boric or fluoboric acids.

Inasmuch as the content of fluoboric acid was believed to be sufficient as judged from the pH, attention was focused on the free boric acid concentration. It was also noted that the precipitate formed only under conditions of relatively high anode current densities and that it had not been encountered under similar plating conditions with Bath A. The latter, in addition to having a somewhat higher nickel content which is believed to be of minor importance in this connection, contained over twice as much boric acid and also an appreciable quantity of nickel chloride.

Accordingly, a quantity of boric acid equivalent to 15 g./l. was added bringing the total free H_3BO_3 to about 32 g./l. Several tests were made with this modified solution under similar conditions as previously. From the two Hull cell tests which were plated under

similar conditions, it was seen that the increased boric acid content resulted in a somewhat higher limiting current density and that no basic nickel salt formed at the cathode. Furthermore, there was no formation of precipitate, the solution remaining perfectly clear. However, the amount of gassing at the anode was not appreciably decreased whereas, with the solution which differs essentially only in having chloride present, practically no gassing at the anode occurred when comparable currents were used in Hull cell tests. The tendency to pit was not alleviated by the increase in free boric acid content. In fact, if anything, pitting was somewhat more pronounced on the Hull cell plates after the addition.

A further series of tests with cylindrical cathodes was conducted with the modified solution and the investigation was extended to somewhat higher temperatures — up to 45°C. The pH was adjusted with nickel carbonate to the same value, 2.4, previously used. In comparison with tests made under similar conditions it was found that the increased boric acid content gave a noticeably whiter, more satin deposit. Confirming the previous Hull cell tests, a somewhat greater value for the limiting current density was obtained at the same temperature. Also, as expected, the tests at higher temperature resulted in a considerable increase in the limiting current density. Fewer adjustments were required to maintain the pH with the greater free boric acid concentration and there was considerably less tendency for basic salts to be precipitated on the cathode at values above the limiting current density.

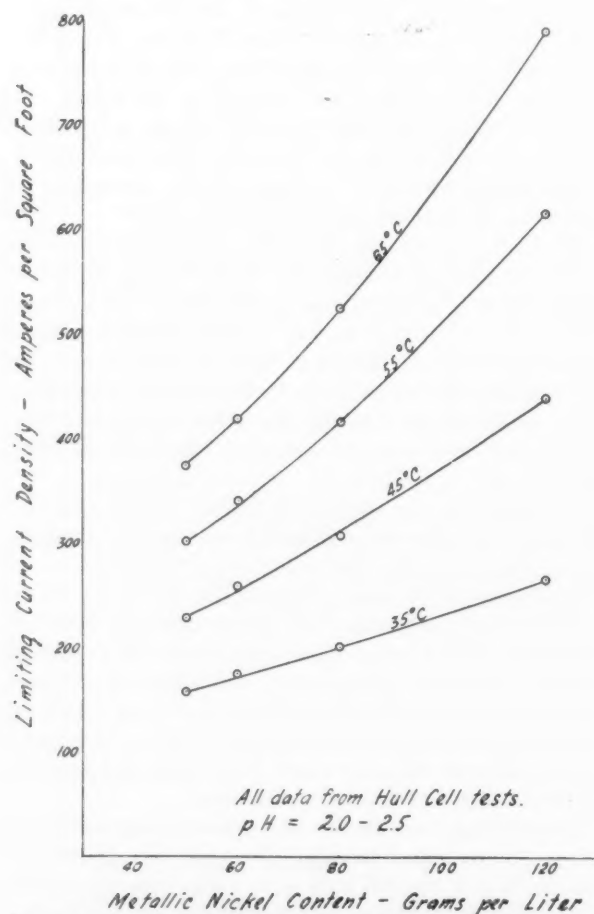


Figure 7. Limiting current densities vs. Nickel content for nickel fluoborate solutions at various temperatures.

In view of the tests with this solution and the others previously conducted it would seem indicated to operate the nickel fluoborate baths with concentrations of free boric acid of at least 30 g./l. and of chloride equivalent to a content of at least 15 g./l. nickel chloride. This is particularly true if comparatively high anode current densities are likely to be encountered.

Medium Concentration Bath

Solution B was prepared and tests made with it primarily to obtain data on limiting current densities for a solution having a nickel content intermediate between Solutions A and C. A nickel concentration of 80 g./l. was chosen as that is the metal content of the commercial bright nickel solution being used for comparative purposes. No additional boric acid was used, the content derived from the concentrate being about 28 g./l., and no chloride was added. The solution was used as prepared and had a pH of 2.4.

Only one series of tests was conducted and that with the Hull cell covering the range of temperatures from 25°C. to 65°C. They are plotted as part of Fig. 4. As for the other solutions, the variation of limiting current density with temperature is linear.

Fig. 4 presents in graphical form the data obtained by means of the Hull cell on the variation of limiting current density with temperature for the several solutions, each having a different metallic nickel content. From this chart values of the limiting current densities corresponding to the various nickel contents have been taken at 10°C. intervals in the temperature range from 35°C. to 65°C. and these are plotted on Fig. 7. The latter chart can, therefore, be used for determining, within the ranges covered, the limiting current density for a solution with any given metal content. Fig. 5 shows the relationship of current densities vs. current efficiencies.

Comparative Tests with Nickel Sulfate Solutions

In order to be able to compare the nickel fluoborate solutions with the two commercial nickel sulfate baths previously described, a series of tests was run on each both with the Hull cell and the cylindrical cathodes.

Data on the variation of limiting current density with temperature was obtained for these solutions by means of the Hull cell and has been plotted on the same chart against similar data for a nickel fluoborate solution having the same metallic nickel content. Fig. 8 presents this comparison for solutions with 80 g./l. nickel concentration which is the metal content of the bright nickel solution. Likewise, Fig. 9 compares solutions having 64 g./l. nickel content which is the concentration in the Watts solution used in this investigation.

In both cases, it is apparent that considerably higher current densities can be employed at any given temperature with a nickel fluoborate formulation than with one based on nickel sulfate having the same metal content. The order of difference ranges from about two times to almost four times depending on the temperature and formulation. In making this comparison, consideration should also be taken of the fact that the fluoborate solution can be operated satisfactorily at

higher temperature than is the case for the sulfate bath. Specifically, the optimum temperature for operating the Watts bath is about 45°C. whereas a fluoborate solution with the same metal content can be used with good results up to at least 65°C. The respective limiting current densities, as read from Fig. 9, are about 145 amp./sq. ft. for the sulfate as against 460 amp./sq. ft. for the fluoborate solution.

Of course, in normal practice operation of a bath even close to its limiting current density values is never undertaken, the maximum average current density employed being usually no more than about 40% to 50% of the limiting value. However, this qualification applies equally to all formulations so that the above analysis still holds percentage-wise. In other words, 60 amp./sq. ft. would probably be used as the maximum normal current density for the Watts formulation as against a comparable figure of about 175 amp./sq. ft. for the fluoborate solution, both when operated near their respective maximum operating temperature.

A similar analysis made for the case of the commercial bright nickel solution as compared to a fluoborate solution of the same 80 g./l. metal concentration, from the data presented on Fig. 8, shows that it would be possible to operate the fluoborate solution at a normal current density of about 200 amp./sq. ft. as against 50 amp./sq. ft. for the bright sulfate solution, the operating temperatures being taken as 65°C. and 50°C. respectively.

Judged from the above data, therefore, it should be possible to employ up to three or four times the cathode current density with the fluoborate solution as with a sulfate solution of the same metallic nickel concentration.

Cylindrical cathode tests were made at 30 amp./sq. ft. at the temperature and pH value normally used with these two baths. Also, some tests were made at higher current densities and for lengths of time sufficient to give a deposit having a nominal average thickness of about 0.005". The latter were intended mainly for use in determinations of Knoop hardness numbers.

Almost identical results were obtained on tests at 20 amp./sq. ft. made with either brass or steel cathodes. Cathode efficiencies were somewhat higher in the tests conducted at higher current densities except for a test where 300 amp./sq. ft. was employed and the limiting current density was exceeded on part of the cathode.

Cell voltages were definitely higher for this series of tests on the sulfate solutions than for those previously conducted with the fluoborate formulations of comparable metal content and at similar current density and temperature ranges.

Throwing Power Tests with Haring Cell

For the purpose of obtaining numerical expressions for throwing power and throwing efficiency of the fluoborate solution in comparison with the two sulfate baths the following apparatus was set up and procedure followed:

A form of Haring cell was used, made of molded polystyrene with inside dimensions 3" wide x 6" long x 2" deep having slightly rounded corners. The depth of solution was 1.375" with the 400 ml. volume used. Cathodes of polished copper, 2" x 2.75" x 0.025" were

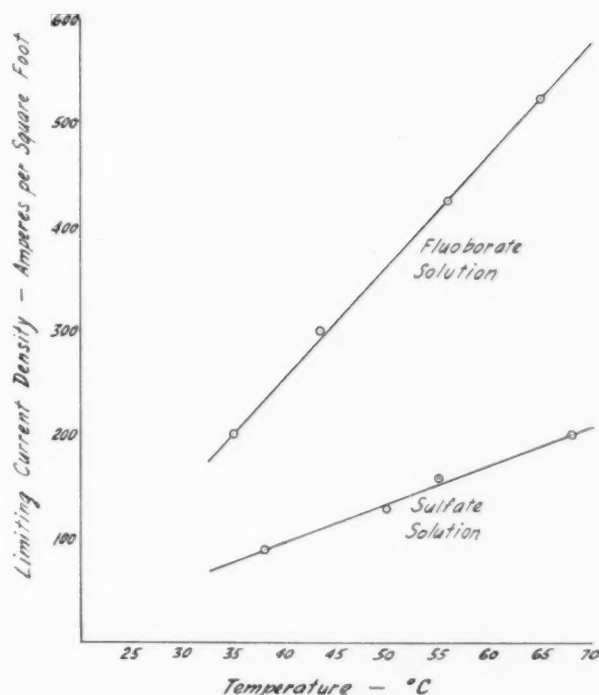


Figure 8. Comparison of limiting current densities: nickel fluoborate vs. nickel sulfate solutions. Metallic nickel concentration = 80 grams per liter. Note: The sulfate solution is a commercial organic bright nickel formulation.

used. The submerged plated area of each cathode was 3.78 sq. in. The anode was made of thin nickel sheet and was perforated with a series of drilled holes to aid in preventing anode polarization. The submerged anode area was almost the same as that of the two cathodes together, or about 7.56 sq. in., so that the anode : cathode ratio was essentially 1:1 making the anode current density equivalent to that of the cathode. The anode was placed 1" from one end and 5" from the other so that the distance ratio or primary current distribution ratio was 5.0, as in the usual Haring cell. The same thermostatic bath was used for holding the Haring cell as employed for the other work.

Sufficient ampere-minutes of current were passed during each test to deposit an average thickness of 0.0005" Ni at 100% efficiency. 29.93 ampere minutes were used and the theoretical amount of nickel dissolved from the anode or deposited on the cathodes was 0.547 grams. Throwing power and throwing efficiency were calculated.

The apparatus as set up, ready for a test, is illustrated in Fig. 10. Five series of tests were made with this apparatus, as follows:

1. One test was made on each of the four solutions at the same temperature, 50°C. and current density, 40 amp./sq. ft. The fluoborate solution, containing chloride was found to be better than that free of chloride, with respect to throwing power and also as to both cathode and anode efficiencies. The throwing power of this solution compares favorably with that of both of the sulfate baths under the conditions employed.

2. Three sets of tests were made with varying pH to determine the effect on throwing power and current efficiencies. Only the chloride-containing fluoborate solution was thus tested, the pH values selected being

2.5, 3.5, and 4.6 and the temperature being held constant at 60°C. In each series, tests were made at 20, 40, 80, and 150 amp./sq. ft.

3. Finally, another test was made on each of the two sulfate baths, selecting conditions as to temperature and current density at which these two particular baths are normally operated, namely 55°C. (131 deg. F.) for the bright nickel solution, 45°C. for the Watts solution, and 25 amp./sq. ft. for each.

The results of these tests may be summarized as follows:

1. As stated before, the fluoborate solution containing chloride gave better throwing power and anode and cathode efficiencies than the solution containing no Cl.
2. The pH of 3.5 gave the best results for throwing power of fluoborate solutions.
3. In general, the throwing power decreased markedly with increasing current density. This was true of the sulfate and fluoborate solutions both.
4. In general, the cathode efficiency increased at higher current densities.
5. In general, the cathode efficiency increased with pH.
6. The fluoborate bath when operated at pH values of about 2.5-3.5 exhibits better throwing power and approximately similar anode and cathode efficiencies compared to the sulfate baths operated under their normal conditions.
7. The fluoborate bath showed an improvement in throwing power when the temperature was increased from 50°C. to 60°C. at the same current density, 40 amp./sq. ft.
8. The anode efficiency of the fluoborate bath containing chloride equivalent to 15 g./l. nickel chloride is near 100% under the fairly wide operating conditions of 20 to 150 amp./sq. ft. current density, 50-60°C. temperature, and pH of 2.5 to 4.6.

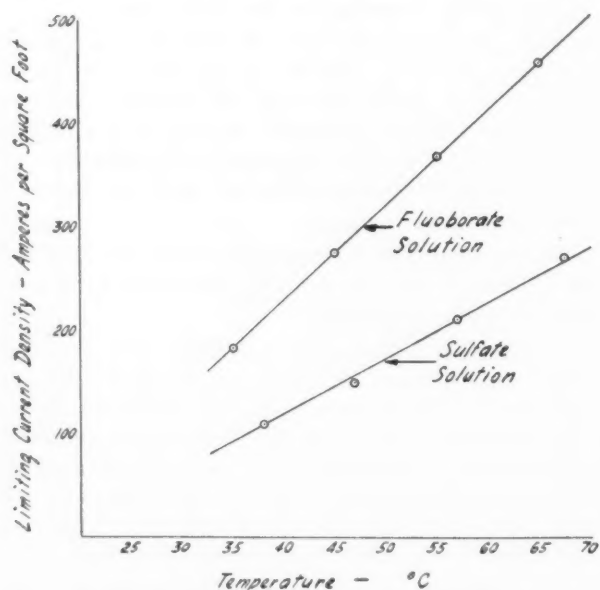


Figure 9. Comparison of limiting current densities: nickel fluoborate vs. nickel sulfate solutions. Metallic nickel concentration = 64 grams per liter. Note: The sulfate solution is a commercial high pH Watts nickel formulation.

9. The cell voltage required to operate at a given cathode current density and temperature is markedly less for the fluoborate solution than for either of the sulfate baths. For example, at 50°C. and 40 amp./sq. ft., the fluoborate solution required 1.78 volts as against 2.85 volts for the bright sulfate and 2.82 volts for the Watts solution. This comparison shows that only about 60% as much direct power consumption was required for the nickel fluoborate solution as for the bright nickel sulfate solution containing almost the same metal concentration.

Impact Tests

The panels used in making these tests were of low carbon, cold rolled steel of the same stock and approximately 2" x 2.75" x 0.035" thick. Since the same cell and the same solution volume, 400 ml., were used for this work as in the Haring cell tests, the plated depth was 1.375" and plated area 3.78 sq. in. The cathode was supported vertically and centrally between the two nickel sheet anodes which were placed against the two ends of the cell so that the inter-electrode distance was about 3" and the effective anode and cathode areas were the same, 2.56 sq. in. Since sufficient current was passed to obtain a nominal thickness of deposit of 0.0005", the same values of amperage and time were employed as for the comparable current density tests in the Haring cell series. The cell was held in the thermostatic bath during all tests.

Five sets of panels were run as follows:

- a. Three sets with the same nickel fluoborate solution, containing 80 g./l. Ni, 15 g./l. $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$, and 30 g./l. free H_3BO_3 , previously used in Haring cell tests. The solution temperature was maintained at 60°C. and the pH at values 2.5, 3.5, and 4.6 respectively for the three different sets, each of which included tests at 20, 80 and 150 amp./sq. ft.
- b. One set of three panels using the commercial bright nickel solution, at the same temperature and current densities as employed for the tests with the fluoborate solution.
- c. A last set of three panels on the Watts solution. Two of these were run at a temperature of 50°C. and current densities of 20 and 80 amp./sq. ft. whereas the third was plated at 55°C. and 120 amp./sq. ft.
- d. Since another good opportunity was afforded to check current efficiencies under these various conditions and particularly since steel panels were used, all cathodes were weighed before and after plating. The anodes, on the other hand, were weighed only once for each set so that the average anode efficiencies for each set could be calculated.

The plated specimens were allowed to age from 16 to 20 hours and were then subjected to the impact test. The latter test consisted of clamping the plate between two annular rings and allowing a block to fall from a definite height upon a pin with a hemispherical end which rested directly on the metal specimen at the point where it was clamped so that a cup would be drawn into it.

The block weighed about 10 lbs. and the diameter

of the pin on which it was allowed to fall was about 0.75 in. Two tests were made on each panel, in one of which the weight was allowed to fall once from a height of 24" and in the other twice, first from a height of 17" followed by a second drop from a height of 20". The two corresponding cups drawn in the metal were approximately 0.75" diameter x 0.13" deep and 0.75" diameter x 0.20" deep. In all cases, the double impact test resulted in the metal actually being stressed beyond its limit, a crack appearing at the apex of the cup.

This is quite a severe test and a deposit that will still be adherent and not flake off or show cracks other than those due to the stress in the basis metal itself must indeed be ductile. Also, the test integrates the quality of the cleaning cycle with that of the plating itself so that extreme care was taken to see that all steps of the cleaning cycle used were identical in every test. It should be stated that, in normally conducting this test on the two commercial sulfate baths (Watts and bright nickel), a copper flash is used before the nickel plate which probably serves to aid the adhesion. Such a flash coating of copper was not used in any of the tests of this research, partly since it would have interfered with obtaining accurate values of cathode efficiencies.

The results of the tests may be summarized as follows:

1. Anode efficiencies of all solutions under the conditions investigated approximated 100%.
2. Cathode efficiencies of all solutions increased as current densities increased.
3. Cathode efficiencies of the fluoborate solution improved with increasing pH.
4. The direct power requirements, as reflected by the cell voltage, for operating at a given current density are considerably less for the fluoborate than for the sulfate solutions. As in the Haring cell tests, about 60% as much power consumption is required for the fluoborate as for the sulfate baths at comparable current densities.
5. In the case of the fluoborate solution, the best performance under the impact test was obtained at a pH of 3.5, all tests even at the relatively high current density of 150 amps./sq. ft. showing excellent adhesion and no cracking of the deposit (except, of course, where the basis metal itself had cracked).
6. With the fluoborate solution at pH values of 2.5 and 4.6 as well as with the two sulfate solutions the tendency to crack or peel increased with increasing current density.
7. The commercial bright nickel solution showed to least advantage in this series of tests, cracking and flaking or peeling of the deposit being evident in all cases.
8. The fluoborate solution at 3.5 pH gave results better than the Watts solution which, under the conditions employed, is known to produce excellent ductile deposits.

Preliminary Investigation of Wetting Agents

From the results obtained with the fluoborate solutions as a whole it is evident that pitting was an ever-recurrent source of trouble. Also, it had been found

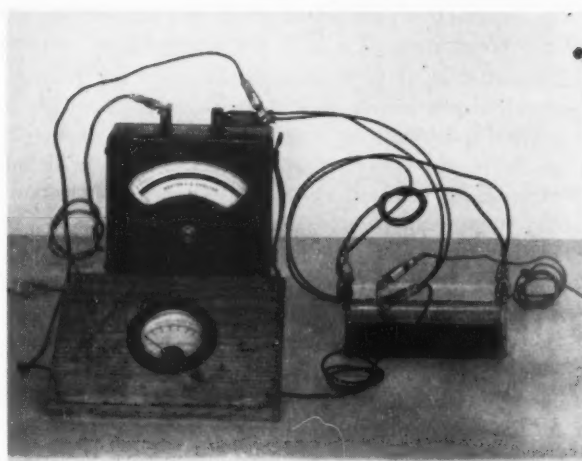


Figure 10.

that the addition of hydrogen peroxide could not be depended upon to eliminate the pitting.

In any event, since it was intended to investigate the possibility of formulating a fluoborate bright nickel solution based on organic addition agents and since the latter would undoubtedly be adversely affected by the addition of hydrogen peroxide, it was decided first to explore the field of wetting agents. If such a suitable agent could be found it would then be tried for compatibility with the several brighteners that were in mind to be tested.

From the various types and makes of wetting agents available certain ones were selected for trial. All of the materials specifically mentioned by Young & Coons as having found application in nickel plating solutions were included among those investigated as was the non-pitting agent supplied for the commercial bright nickel solution.

Tests were first conducted for the purpose of determining whether the solution remained clear or became hazy or showed other obvious signs of any adverse effect upon the addition of the wetting agent.

Of the twelve materials tested, only four were found to produce no haze with the fluoborate solutions in the maximum concentrations used. One of these, Tergitol 08, is given in Young & Coons as having been found to produce no haze in a sulfate nickel bath when used in equal proportions with Tergitol 4. This mixture, accordingly, was prepared since it was felt that, although Tergitol 4 had been found to produce cloudiness, the admixture with Tergitol 08 might remain clear. However, haziness developed as with the Tergitol 4 alone. Similar results were obtained with the mixture of Duponol 80 and Neomerpin N also referred to by Young & Coons.

The latter also give Duponol ME Dry as an agent usable for this application and it has been stated elsewhere that sodium lauryl sulfate, which is the active ingredient of this wetting agent, is being used in this country. It was noted that this compound gave only a faint although distinct opalescence to the solution and that this haziness did not greatly increase when up to an equivalent of 2.0 g./l. was added.

Duponol 80 was found to be compatible with the fluoborate solution up to a concentration of 0.35% at 60°C. On cooling to 25°C. this mixture became quite

hazy. Another sample tested at 25° became opalescent at a concentration of 0.25% wetting agent by volume.

Duponal ME Dry, the non-pitting agent for the commercial bright nickel bath, and Daconol A which is marketed specifically as a wetting agent for nickel solutions, were separately tested for compatibility with the Watts sulfate solution and found to produce no turbidity or precipitate when added to the extent used in the other trials. This definitely indicates that there is either a reaction of these materials with the fluoborate ion or, at least, that the latter seriously affects the solubility of these particular substances.

The Duponal ME Dry and Daconol A were available before the other samples were received and some tests were made with them. The latter was added to one of the fluoborate solutions and tests made with it. Unsatisfactory results were obtained and the wetting agent was finally removed by a carbon treatment.

Three hundred ml. of fluoborate solution were prepared containing 120 g./l. Ni and about 40 g./l. free H_3BO_3 . No Cl was added and the pH was 2.4 (MCP). The solution was treated with six-tenths gram of carbon at a temperature of 70°C. for 30 minutes and filtered. Hull cell tests showed a general pitting condition over the entire plating range. The cylindrical cathode test at 20 amp./sq. ft. showed a pitted, satin, matte deposit.

The concentration of Daconol A recommended by the supplier as sufficient to reduce the surface tension of nickel plating solutions to about 35 dynes/cm. is about 2.5 g./l. and this amount was accordingly, added.

Two cylindrical cathode tests and two Hull cell tests were run with this solution. Results were bad, the deposits being dark in color and quite rough. Also, although pitting was eliminated in the cylindrical cathode tests which were conducted at relatively low current density (20 amp./sq. ft.), some pitting was still evident in the higher current density range (50-110 amp./sq. ft.) of the Hull cell plates. This confirms the fact that plating solutions should not be operated with wetting agents, or probably organic addition agents in general, at or near their limit of solubility in the solution.

The solution was then subjected to a carbon purification, one gram of carbon being added, after which the solution was maintained at 70°C. for a period of 6 hours with intermittent stirring. After filtration, a reading of 72.0 dynes/cm. at 25°C. was obtained on the absolutely clear solution with the stalagmometer, equivalent to that of water and indicating that the Daconol A had all been removed.

The tests using Duponal ME Dry were conducted in connection with the preliminary work on the development of a bright fluoborate nickel solution to be described in a subsequent section and will be covered there. In brief, the surface tension of a fluoborate solution containing 60 g./l. of metallic nickel was reduced from 72.7 to 28.5 dynes/cm by the addition of 0.5 g./l. of Duponal ME Dry. After several filtrations during the course of the experimental work, the solution had a surface tension of about 40 dynes/cm. The solution was always just barely opalescent and pitting of the work was almost entirely eliminated. However, the brightness of the cathodes was somewhat affected by

the presence of this agent, this being particularly noticeable on Hull cell plates.

(The final installment of this article will appear next month.)

REPORT OF THE ANNUAL CONFERENCE OF THE INSTITUTE OF METAL FINISHING

(Concluded from page 52)

painting and is avoided by using a chromic acid rinse after phosphating at room temperature, ensuring maximum uniform drain, and holding the work upright before passing through the drying oven so that the final evaporation of drainings is away from the important areas. It is also helpful to incorporate phosphoric acid in the final rinse.

EDUCATION IN METAL FINISHING

by The Earl of Halsbury.

This discussion was specially arranged by the Education Committee of the I.M.F. to find ways and means both to improve the training facilities of the industry and to attract boys of school-leaving age. Opening this discussion with a paper entitled 'Metal Finishing — Technique or Technology' the Earl of Halsbury began by making an analysis of the type of education wanted for different types of personnel needed by the industry. He distinguished between functional education concerned primarily with the tasks needed to carry out process control and development and intellectual education which is carried out at University for the scientist and the research scientist. The latter should have 3-4 years and 5-7 years formal 'intellectual' study respectively while the technicians and technologist should have respectively the same lengths of 'functional' education at a technical college. In this classification, the scientist would generally be used as a routine analyst, research assistant, plant manager or administrator. The research scientist would form the nucleus of the research team responsible for discovery. On the technical level, the technician is primarily needed for technical control and employment and at managerial and sub-managerial level, while the technologist is used on specific projects involving development work. The classification is, however, elastic and allows for over-lap of functions.

Lord Halsbury believed that the technician and technologist required a new type of course. The metal finishing technologist should qualify with the equivalent of a three year degree course in chemistry, physics or engineering, followed by two post-graduate years in which his education should be evenly divided between research and study. The technician should have a 2 year chemistry course followed by a third year studying topics involved in metal finishing and doing sufficient practical work to obtain a birds eye view of the art.

Later speakers in the discussion gave the view of different sides of the industry on education. Of some interest was a communication from *Dr. G. Dubpernell*, read by *T. Coyle*, who described the facilities in the U.S.A. The general consensus was that a national apprenticeship scheme should be started and that a national metal finishing college should be founded.

Electroless Nickel Deposition

Activation of Non-Metallic Surfaces

By Fred Pearlstein, Pitman Dunn Laboratory, Frankford Arsenal, Philadelphia, Pa.

IN the use of the electroless nickel process, as developed by Brenner and Riddell, metal deposition is obtained by the chemical reduction of nickel from a hot buffered solution of nickel salts. A typical formulation which deposits approximately 0.2 mil of nickel per hour at 190°F. is:

Nickel Chloride, $\text{NiCl}_2 \cdot 6\text{H}_2\text{O}$	30 g/l
Sodium Hypophosphite, $\text{NaH}_2\text{PO}_2 \cdot \text{H}_2\text{O}$..	10 "
Sodium Citrate, $\text{Na}_3\text{C}_6\text{H}_5\text{O}_7 \cdot 5\frac{1}{2}\text{H}_2\text{O}$	10 "

The deposition, however, will occur only upon certain metallic surfaces. The catalytic metals which are known to initiate nickel deposition are iron, nickel, cobalt, aluminum, palladium, and sometimes silver and gold. Since nickel itself is a good catalyst, once the initial nickel deposit is obtained upon a surface, deposition will continue as long as the solution remains workable. In order to apply the electroless nickel coating to non-catalytic metallic surfaces, one of the following pretreatments must be employed to produce a film of catalytic metal upon the surface.

1. Dip into a solution of palladium salts to produce an immersion coating of palladium upon the surface. This method is especially useful for the plating of copper and brass.

2. Non-catalytic metals such as copper, brass and silver can be plated by contacting the surface with a more electronegative metal, such as aluminum, while immersed in the electroless nickel solution. Presumably, galvanic action initiates nickel deposition.

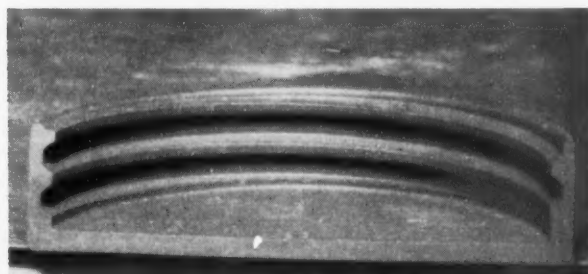
3. Initiate deposit from electroless nickel solution with an external source of current to produce a thin coating of nickel upon which electroless deposition can proceed.

Non-metallic materials are in general non-catalytic. However, if a film of one of the catalytic metals mentioned above could be applied to non-metallic surfaces, the surfaces would then be active for electroless nickel deposition.

This article deals with the effort to produce a thin film of palladium upon non-conductors, thereby rendering the surface active for the reduction of nickel from the electroless nickel bath. The experimental work was done mostly with sheet polystyrene, which was available in large quantity.

Experimental

Polystyrene, immersed for as long as 20 hours in a PdCl_2 solution (0.1 g/l, pH = 1.7), rinsed, and exposed to the electroless nickel solution, failed to be



Bakelite Bottle Top.



After Plating with 2.5 mils of Electroless Nickel.

coated with nickel. However, when a roughened panel was immersed into the same PdCl_2 solution and placed into the electroless nickel bath without rinsing, most of the area was soon found to be coated with nickel. Apparently, the reducing environment of the electroless nickel bath caused reduction of the PdCl_2 solution adhering to the plastic. This method rarely produced complete coverage of nickel, and excess PdCl_2 entering the electroless nickel bath resulted in its premature decomposition. Roughened polystyrene was then placed in the PdCl_2 solution at about 190°F . for about 15 minutes and thoroughly rinsed. When placed into the electroless nickel solution, portions of the surface were found to have been activated and were coated with nickel. Presumably PdCl_2 was caused to be adsorbed upon the surface; whereupon immersion in the electroless nickel solution resulted in reduction of palladium to form an active surface for electroless nickel deposition.

A cleaning procedure was adopted so that the polystyrene surface would be in a uniform condition before applying experimental tests. Cleaning with steel wool and foaming cleanser produced a clean, slightly roughened surface which, however, did not completely wet with water. A 30 second dip in chromic-sulfuric acid cleaning solution was found to be effective for producing a waterbreak-free surface after the steel wool and cleanser treatment.

In all cases, the films formed by immersion of non-metallic materials in the PdCl_2 solutions were invisible. The presence of an activating film was ascertained by its ability to initiate nickel deposition from the electroless nickel solution. The effectiveness of the treatment was determined by the estimated percentage of the area which was found to have been coated with nickel.

Polystyrene panels were rinsed for two minutes in 0.1 g/l PdCl_2 solutions of varying pH and temperature, rinsed, and submerged in the electroless nickel solution. The results are shown in Table 1.

TABLE 1
Effect of pH and Temperature

pH of PdCl_2 Soln.	Percent of Area Coated with Nickel			
	80°F .	110°F .	125°F .	165°F .
3.0	0	0	2	10
3.4	0	15	25	100
3.8	0	99	100	100
4.4	40	99	100	100
4.8	90	100	100	100
5.8	0	2	5	—

As can be seen from Table 1, an increase in the temperature of the PdCl_2 solution increases the permissible pH range which can be satisfactorily employed.

Stannous Chloride Predip

In an effort to improve upon the process described above, consideration was given to the use of stannous chloride, which has the well known property of being readily adsorbed upon many materials and is also a strong reducing agent. It was found that when polystyrene is given a SnCl_2 dip prior to the PdCl_2 dip, the PdCl_2 solution need not be heated, and a broader pH

range may be employed. The following procedure was used:

1. Dip 1 minute in 96 g/l SnCl_2 + 56 cc/l HCl 80°F .
2. Rinse.
3. Dip 30 seconds in 0.1 g/l PdCl_2 of varying pH 80°F .
4. Rinse.
5. Dip 1 minute in electroless nickel solution 200°F .

The results are shown in Table 2.

TABLE 2
Effect of Tin Chloride Dip

pH of PdCl_2 Soln.	% of Area Coated with Nickel
0.9	100
1.7	100
4.2	100
8.8	0

Table 3 shows the effect of pH when using a 0.01 g/l solution of PdCl_2 . The permissible pH range of the PdCl_2 solution is decreased when the PdCl_2 concentration is decreased.

TABLE 3
Effect of Palladium Concentration

pH of PdCl_2 Soln.	% of Area Coated with Nickel
1.0	0
3.0	70
4.1	100
6.4	0

The next step was to study the extent to which a stock solution of 0.50 g/l PdCl_2 + 5 cc/l HCl could be diluted before the effectiveness of the solution was affected. The following procedure was used to obtain the data in Table 4:

1. Dip 1 minute in 70 g/l SnCl_2 + 33 cc/l HCl 80°F .
2. Rinse.
3. Dip 1 minute in various concentrations of PdCl_2 80°F .
4. Rinse.
5. Dip 1 minute in electroless nickel solution 200°F .

TABLE 4
Effect of Palladium and Acid

Composition of PdCl_2 Soln.		% of Area Coated With Nickel
0.5	g/l + 5 cc/l HCl	100
0.1	" + 1 "	100
0.02	" + 0.02 "	100
0.004	" + 0.04 "	10

When the solution containing 0.004 g/l PdCl_2 plus 0.04 cc/l HCl was used at a temperature of about 180°F . the polystyrene was completely coated with nickel.

In order to determine the minimum concentration of

SnCl_2 which could be employed, dilutions were made of a stock solution of 100 g/l SnCl_2 plus 50 cc/l HCl. The following procedure was used to obtain the data in Table 5:

1. Dip 1 minute in various concentrations of SnCl_2 80°F.
2. Rinse.
3. Dip 1 minute in 0.1 g/l PdCl_2 pH = 1.7 80°F.
4. Rinse.
5. Dip 1 minute in electroless nickel solution 200°F.

TABLE 5
Effect of Tin and Acid

Composition of SnCl_2 soln.	% of Area Coated with Nickel
100 g/l + 50 cc/l HCl	100
20 " + 10 "	100
4 " + 2 "	100
0.8 " + 0.4 "	100
0.16 " + 0.8 "	100
0.032 " + 0.016 "	20

A small quantity of wetting agent added to the SnCl_2 solutions seemed to be beneficial.

In order to test the ability of materials other than polystyrene to be activated by PdCl_2 solution, the processes described above were applied to the following non-conductors: Plexiglas, polyethylene, Mylar, cellulose acetate, cellulose nitrate, Nylon, glass, Saran, Teflon, Mycalex, a fragment from a porous aluminum oxide grinding wheel, and Textolite. The materials were roughened and cleaned before applying the activating treatments, and the following procedures were used:

A.

1. Dip 2 minutes in 0.1 g/l PdCl_2 160°F. pH = 4.5.
2. Rinse
3. Dip 1 minute in electroless nickel solution 200°F.

B.

1. Dip 1 minute in 70 g/l SnCl_2 + 40 cc/l HCl, 80°F.
2. Rinse.
3. Dip 1 minute in 0.1 g/l PdCl_2 + 1 cc/l HCl, 80°F.
4. Rinse.
5. Dip 1 minute in electroless nickel solution, 200°F.

The results of these tests are shown in Table 6.

TABLE 6
Results on Non-Conductors

Material	Percent of Area Coated with Nickel	
	A	B
Polystyrene	100	100
Plexiglas	60	100
Polyethylene	30	90
Mylar	100	100
Cellulose Acetate	95	100
Cellulose Nitrate	10	100
Nylon	100	100
Glass	1	100
Saran	99	100
Teflon	10	80
Mycalex	0	0
Alundum	80	100
Textolite	100	100

Difficulty was encountered in completely coating some of the materials listed in Table 6 because of incomplete wetting by the solutions. Proper choice of wetting agents may rectify this situation.

It must also be remembered that the procedures described above were developed for coating polystyrene. Modification of solutions and technique may be necessary depending upon the characteristics of the particular material to be coated.

Summary

Simple immersion of polystyrene and other non-metallic materials in PdCl_2 solutions resulted in the treated surface being active for electroless nickel deposition.

A satisfactory treatment for polystyrene consists of a two minute immersion in 0.1 g/l PdCl_2 at 125°F. within the pH range of 3.8 to 4.8. When polystyrene is given a pre-dip in SnCl_2 solution, the PdCl_2 solution can be used at room temperatures within the minimum pH range of 0.9 to 4.2. Certain other non-metallic materials can be successfully treated in the same manner as polystyrene. Other materials have also been found capable of being coated with electroless nickel. Among these are quartz, wood, graphite, Bakelite, celluloid, titanium, tungsten carbide, cork, Dacron, and silicon carbide.

Acknowledgement

The author wishes to thank the ordnance corps for permission to publish this article and Dr. G. F. Nordblom for his many helpful suggestions.

ERRATUM:

In the article entitled "Bronze Plating: Why and How," which appeared in our July issue, there is an error on Page 51. The second column, seventh line from the bottom, reads: "cost factors, also, are unattractive." The statement, obviously, should be, "cost factors, also, are attractive." Our apologies, Mr. Lowenheim.

Science for Electroplaters

6. Valency

By L. Serota

VALENCY in a general way refers to the combining power of atoms. The bond (chemical) formation by which the atoms are held together can be effectively interpreted in terms of the extranuclear structure of the atom.

Following Dalton's atomic theory, Berzelius (1812) advanced the view that the bond between elements in chemical compounds could be attributed to electrostatic forces. Some elements he assumed were electropositive, while others were electronegative. Although this idea was a significant advance toward the modern interpretation of the characteristics of atoms, it could not satisfactorily explain the formation of organic compounds in which the elements did not show the electropositive and electronegative characteristics required in his theory.

This theory was replaced by the theory of structural formulas, which provided a satisfactory explanation for the formation of organic compounds. The success of this assumption was based upon the fact that in its basic concept it did not take into account the nature of the forces between atoms. The subsequent development of the theory of electrolytic dissociation by S. Arrhenius (1837) re-established the theory of electrostatic forces with the evidence that there are apparently two types of valency, ionic and non-ionic.

The discovery of the electron by J. J. Thomson in 1904 led to the rapid development of the electron theory of valency. The proposal was first made

by Thomson that valency must be associated with the electron and that the electrostatic forces could be attributed to the transfer of electrons. The quantitative measurement of electrostatic forces, made by Coulomb (1780) is referred to as Coulomb's Law, which states that the magnitude of the force, acting between two charges, is proportional to the product of the two charges and inversely proportional to the square of the distance between them.

The most significant advance in the modern view was the theory, presented independently by Kossel and Lewis in 1916, that the inert gas elements represented stable configurations. The completed outer shell contained eight electrons (octet) with the exception of helium which contained but two electrons for the completed quantum level. The stability of these completed groups is emphasized by the high ionization potential for the inert gases. Ionization potential is the potential (volts) required to transfer an electron from its normal quantum level to infinity. For example, the ionization potential for neon is 21.48 volts, whereas for sodium it is only 5.12 volts. This represents the energy required to completely separate the first, most loosely bound, electron from the atom, leaving a positively charged body (positive ion) which is termed the kernel. This differs from the energy (potential) required to promote an electron to higher electropositive, and the elements preceding the gas elements are electronegative. Such elements, when uniting chemically, will readily lose or gain electrons to attain the outer shell configuration of inert gas atoms. Thus, the elements in group I with one electron in the outer shell would tend to lose this single electron, thereby reverting to the structure of the inert gas element. Elements in group VII with seven electrons in the outer energy level, would gain a single electron in attaining a stable configuration. The group I elements, in giving up the single outer shell electron, would assume a positive charge of plus one; and the group VII elements, in gaining an electron for a completed outer shell, would carry a negative charge of minus one. This change whereby the atom acquires a positive or negative charge is termed ion formation. In similar manner an element in group II would give up both electrons from the outer quantum level and become an ion with a charge of plus two.

Valency can therefore be considered as the expression representing the number of electrons an atom must gain or lose so that the stable configuration of an outermost shell will result. Such structure will correspond to that of the nearest inert gas element. As will be shown later, electrons may be transferred, resulting in an ionic (electrovalent) bond; or just shared, giving a non-ionic (covalent) bond.

Ionic linkage can be demonstrated by means of a schematic diagram (Fig. 15) (Bohr-Stoner model) using sodium, mass 23, atomic number 11, to represent the elements in Group I and chlorine, mass 35, atomic number 17, for the elements in Group VII.

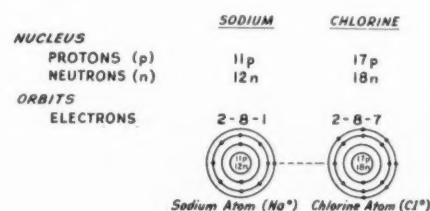


Figure 15.

The electron is transferred from the valence shell of the sodium atom to the valence shell of the chlorine atom, resulting in the formation of the ionic compound. Sodium chloride (NaCl) with a positively charged sodium ion, (neon configuration) and a negatively charged chlorine ion, (argon structure). Figure 16 represents the ionic diagram.



Figure 16.

It will be observed that in both diagrams the complete shell (octet) is indicated.

The formation of ions that results from the transfer of electron(s) from one atom to another is termed electrovalence. Another method of indicating this ion formation is to represent the atom by its valence shell electrons only, using dots to designate electrons. This idea is based upon the fact that chemical union concerns itself with these electrons only. This method is especially useful in representing organic reactions or compounds.

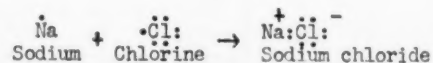


Figure 17.

X-ray studies show that sodium chloride crystals consist of sodium ions and chlorine ions held together by electrical attraction. The ions are arranged in a definite pattern (a cubic structure) with each sodium ion surrounded by six chlorine ions (Fig. 17). Such orientation of ions is characteristic of electrovalent compounds in the crystalline solid form. Solid sodium chloride should not be considered as a stable molecule. It should, instead, be looked upon as a formula representing a compound consisting of an equal number of sodium and chlorine ions.

With elements in Group II, chemical combinations with chlorine would result in two chlorine atoms gaining completed shells. This is possible because atoms in Group II have two valence electrons available. If magnesium mass 24, atomic number 12, is used to represent the combining of chlorine with elements of Group II, the schematic diagram (Figure 18) for this compound formation would be as follows:

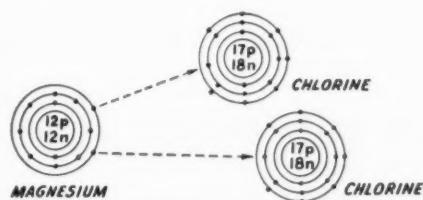


Figure 18.

One magnesium atom will transfer two valence electrons to two atoms of chlorine, forming the electrovalent compound magnesium chloride, consisting of a magnesium ion with a charge of plus two (+2) and two chlorine ions each with a charge of minus one (-1). In the same manner elements belonging in Group III have three valence electrons available for chemical combination. One atom of aluminum (group III), for example, can provide enough electrons to give complete outer shell arrangements to three chlorine atoms. The modern concept of the wave nature of electrons and the uncertainty of following the motion of an electron in a sharply defined orbit limits the use of schematic diagrams. The Bohr-Stoner model used in these diagrams should be interpreted as symbolic representation.

It is evident that the most active metals are the alkali metals (Group I) because they need lose but one electron to ionize in compound formation. The alkali earth metals (Group II) are

not as active as the alkali metals, since two electrons must be removed from the atom and the second electron requires a much higher ionization potential. The weakest, accordingly, would be the metals in Group III, since the third electron requires higher potentials than that required for the removal from the atom of the second valence electron. A comparison of the ionization potentials of the groups of metals just considered emphasizes the relationship of ionization potentials to chemical activity. The following values represent the ionization potentials required for the removal of the single valence electron from the sodium atom (changed to an ion), the two valence electrons for magnesium and the three for aluminum.

$$\begin{aligned}\text{Na}^+ &= 5.12 \text{ volts;} \\ \text{Mg}^{++} &= 22.58 \text{ volts;} \\ \text{Al}^{+++} &= 53.0 \text{ volts.}\end{aligned}$$

The ionization potential decreases as one proceeds towards the elements in a group with the higher atomic numbers; or, expressed otherwise, the heavier elements in the group will show an increased tendency to lose electrons. This is due to the fact that valence electrons for the heavier elements are in higher energy levels and are not held as strongly as the lighter elements with lower quantum levels, those that are close to the nucleus. For Period II the ionization potential for the element lithium, with the lowest atomic number, is 5.63 volts, whereas the heaviest element (highest atomic number) in this group, cesium, has an ionization potential of only 3.87 volts. Accordingly the element at the bottom of the group is the most active metal, that is, the ease with which metals form compounds will increase as the order proceeds, as, in this example, from lithium to cesium.

Additional information furnished by a study of ionization potential values indicates that, for crystalline compounds, ions carrying a charge greater than plus two are not likely, and ions carrying a charge greater than plus three, with the exception of the heaviest elements (e.g., thorium) are not known to exist.

Variable Valence

A number of metals have several valences. The number of valence electrons such metals will give up will vary. This is a characteristic of the transition elements which contain an

18 electron outer shell kernel. It is believed that one or two electrons from this 18 electron outer electron shell can be removed or promoted to act as additional valence electrons(s). Iron (Fe) for example, mass 56, atomic number 26, will form two kinds of electrovalent compounds; one in which two valence electrons are given up resulting in an ionic charge of plus two, Fe^{++} , and the other with a charge of plus three, Fe^{+++} . (Figure 19).

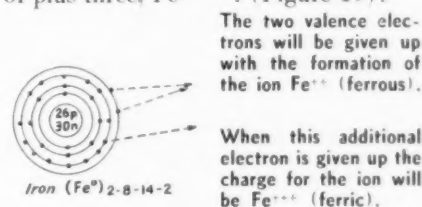


Figure 19.

Covalency

Compound formation can occur by means of a non-ionic bond. Such compounds will not exhibit the characteristics associated with electro-valent compounds. In this type of linkage the electron is not transferred but electron pairs are shared in completing the inert gas shell (octet). The term covalent is used to describe non-ionic linkage. This arrangement provides a satisfactory explanation for the carbon compound bonds and the stability of gaseous molecules for such elements as hydrogen, oxygen, chlorine, etc. The sharing of the single electron in each of the two hydrogen atoms will form a covalent pair giving the completed first shell. The pair of electrons will thus satisfy the conditions for a stable hydrogen molecule (Figure 20).

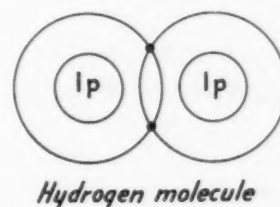


Figure 20.

The same arrangement explains the formation of the chlorine molecule. Each atom provides one electron to the seven valence electrons thereby completing a shared outer orbit (octet).

Covalent linkage can be effectively shown for the simple carbon compound methane in which each of the four hydrogen atoms shares its single valence electron with one of the four valence electrons of the carbon atom. Since the electrons are not transferred, four shared electron pairs result, giving the completed neon structure for

carbon and the stable helium structure for each hydrogen (Fig. 21).

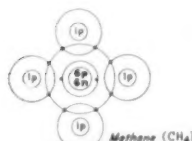
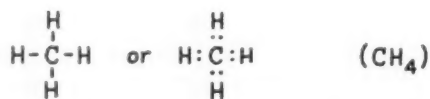
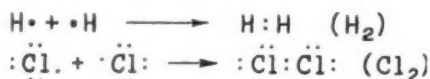


Figure 21.

The arrangement corresponds to the structural formula used so effectively for organic compounds. Each shared electron

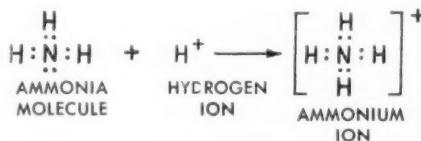
pair refers to the single line (bond) for the carbon valence of four. A simplified form commonly used for indicating compounds with the covalent linkage employs dots to represent the valence electrons.



Coordinate Covalency

Covalency includes a class of compounds in which both electrons for the shared pair (bond) are provided by one of the atoms. To differentiate between the covalent compounds resulting from the contribution of one electron by each atom (normal covalency), the term coordinate covalence is introduced for the type of linkage in which the electron pair is contributed by a single atom. An example indicating coordinate covalence could be shown by the tendency of the gas ammonia, NH_3 , to combine with a hydrogen ion H^+ .

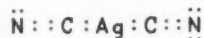
The lone pair of electrons in the ammonia molecule can be shared with the hydrogen ion.



The four hydrogens in the ammonium ion are coordinated with nitrogen, satisfying the completed neon shell for nitrogen and the stable helium configuration for each hydrogen.

Complex Ions

The subgroup elements, such as copper, silver, and gold in sub-group I (Group Ib) are capable of forming stable complex ions. It is a property characteristic of ions containing more than eight electrons in the shell below the valence electron shell. A number of groups, (usually 4 or 6), such as neutral molecules or ions, are capable of being associated through electron pair linkage (covalent bond) with a positive central ion (usually a metal). The number of groups so held represents the coordination number, and the complexes are called *coordination compounds*. This coordination number is independent of the valence of the central metal ion. The electronic formula representing, for example, the complex ion silver cyanide $\text{Ag}(\text{CN})_2^-$, coordination number two would be



The use of compounds with complex ions in plating operations is extensive. The importance and function of these compounds is indicated by the many references in literature. The formation of complex compounds and ions in a plating tank solution serves as a method for maintaining a high metal concentration but a low metal ion concentration. The effect of such decrease in the metal ion concentration is to reduce the crystal size of the deposited metal and improve the throwing power. Another effect of complex ion formation is to increase appreciably the solubility, in some cases, of salts that are slightly soluble, by the addition of a common ion. Silver cyanide, which is slightly soluble, dissolves readily in sodium or potassium cyanide, forming the very soluble complex cyanide. Experimental evidence indicates that the silver ion in the complex cyanide solution exists as the anion $\text{Ag}(\text{CN})_2^-$. A small quantity of the silver ion Ag^+ , it is believed, is also present, probably resulting in an equilibrium between these ions. This hold for other complexions as well.



The double cyanides of sodium and potassium used in the metal cyanide plating baths are very stable.

(To be continued next month)

AMERICAN ELECTROPLATERS' CONVENTION AND EXPOSITION

(Continued from page 44)

relating to association activities. *Manson Glover*, with the Glover Coating Company, presided, and at the close of the meeting introduced the new President, *Hermann Struckhoff* with Lasalco, Inc. The other new officers include *Joseph Duffy, Jr.* 1st vice-president, with Pennsylvania Salt Manufacturing Company; *M. M. Beckwith*, 2nd vice-president, with Harshaw Chemical Co.; *Earl W. Couch*, 3rd vice-president, with Lea Manufacturing Company; *August P. Munning*, secretary, with Munning and Munning Company; *Thomas A. Trumbour*, treasurer, with METAL FINISHING magazine; and trustees — *John A. Bauer*,

Hanson-Van Winkle-Munning; *W. A. Helbig*, Atlas Powder & Supply Company; *G. E. Huenerfauth* Crown Rheo-



Finishing Publications' booth at the Industrial Finishing Exposition was a busy spot.

stat Company; *James L. Clifford*, Udylyte Corporation; and *V. Finston*, The Meaker Company. *Henry Nice* of the Harshaw Chemical Company gave an enlightening talk on the current nickel situation. At the conclusion of his talk a discussion with regard to the credit losses experienced by the members took place, and a resolution authorizing the Board to make a study of a credit reporting service was adopted. Local tax laws were also discussed and referred to the governing board. Resolutions changing from a fiscal year to a calendar year and authorizing the use of MFSA insignia on members' letterheads were adopted. A message of sympathy was sent *Wilfred S. McKeon*, a founder member, to the hospital, where he has been convalescing for some time.

SHOP PROBLEMS

ABRASIVE METHODS SURFACE TREATMENTS CONTROL
ELECTROPLATING CLEANING PICKLING TESTING



METAL FINISHING publishes, each month, a portion of the inquiries answered as a service to subscribers. If any reader disagrees with the answers or knows of better or more information on the problem discussed, the information will be gratefully received and the sender's name will be kept confidential, if desired.

Gold Plating

Question: As a subscriber, I would like to ask a few questions concerning information contained in the METAL FINISHING GUIDEBOOK-DIRECTORY.

First, concerning the formulas for gold and silver immersion plating given on pages 405 and 407 of the GUIDEBOOK, are these processes practical for a commercial decorative plating with respect to economy of operation and quality of deposit? Is the plating smooth and bright and how long should articles be immersed? I would use them for final plating (on copper) on costume jewelry.

Secondly, concerning the formula for gold plating on page 260, is the gold, $\text{KAu}(\text{CN})_2$, supposed to be 68.3% gold content or can a lesser percentage be used by increasing the quantity? The article mentions that the bath can be made more stable by the addition of 0.1-0.5 grams nickel per gallon. What form should this addition be (sulfate, chloride, etc.)? What length of time is required to obtain a deposit of say 0.000005"?

Is it necessary, aside from state codes, to provide ventilation for any of the above solutions?

C. T. B.

Answer: The immersion processes for gold and silver are quite practical for commercial decorative plating. Their application is generally to very small parts which cannot be economically racked or wired. Immersion time should be just sufficient to obtain a color. The deposits will be bright if the base metal is bright and the immersion time is kept to a minimum, especially for silver.

Any assay of potassium gold cya-

nide may be used for gold solutions, since it is the metallic gold content which is controlled. Proportionate amounts are used. Nickel should be added in the form of nickel cyanide. The deposition rate will depend on the current used and the cathode efficiency, which varies with each solution. A thickness of 0.000005" however, should require about 30 seconds, roughly.

These solutions require no ventilation except if desired for the venting of the water vapors. There are no toxic or noxious fumes evolved.

Plating Zinc on Die Castings

Question: We will appreciate information or references that you may have to offer with regard to plating zinc on zinc base die castings. After zinc plating the castings it is desirous to apply a supplementary clear chromate treatment. We have encountered difficulty since our zinc bath is of high caustic nature. Would you recommend a plating bath consisting of a smaller proportion of caustic, or would you prefer that a copper deposition precede the zinc plating?

V. F. S.

Answer: There is no reason why the standard cyanide zinc bath shouldn't give good results on die castings if the plating solution and the chromating bath are in good condition. We would suggest that you check with the suppliers of both the zinc solution brightener and the bright dip to determine whether these are being used correctly.

A copper preplate would be undesirable because of the possibility of contaminating the zinc bath as a result of dragging in copper solution.

Wet Blasting Abrasives

Question: We are interested in the process of abrasive blasting using a liquid medium and would like to know how coarse and fine are the available abrasives.

C. E. R.

Answer: Abrasives for wet blasting range in size from 75 to 5,000 mesh. They are available in metallic, non-metallic and organic types.

Quicking Process

Question: Will you please advise us of the meaning of the term "quicking" as employed in the plating industry. We can find no mention of this word in the trade literature.

C. T.

Answer: This term was employed during the last century for the mercury dip used prior to silver plating to eliminate non-adherent immersion silver deposits. A later term for this process was the "blue dip." The mercury dip is very rarely used at present, due to the possibility of "season-cracking" when plating brass and the improved results obtained with a silver strike solution, the formula for which will be found in any recent edition of the METAL FINISHING GUIDEBOOK.

Acid Neutralization

Question: It is necessary for our plant to neutralize sulfuric acid before running it into the sewer system. Having looked into the matter of which alkali to use for the purpose, I find that the large number of chemicals which can be and are being used creates a problem in itself. I found that various types of lime, slaked and unslaked, limestones, soda ash, and caustic soda all are recommended and I am sure there must be some differences which should be considered in choosing the proper neutralizer. What I would like to know is what is the

best material in your opinion for this application?

A. V. S.

Answer: Caustic soda and soda ash are relatively expensive as neutralizers and are generally employed where the amount of acid is small. They have the advantage that soluble sodium sulfate is the end product, thus reducing the amount of sludge to be handled. Marble or limestone becomes coated with an insoluble film of calcium sulfate which prevents further neutralizing action unless the material is very finely ground and is agitated.

For large volumes of acid, quicklime or hydrated lime are most practical, the latter being used most generally in the plating industry because it doesn't require slaking facilities. Hydrated lime is obtainable as high-calcium lime and dolomitic lime, which is high in magnesium. The choice between the two will depend on your particular installation and disposal facilities. The dolomitic lime will result in less sludge than the high-calcium lime since the magnesium sulfate produced is quite soluble, whereas calcium sulfate is not. On the other hand, high-calcium lime is slightly cheaper to use and will produce a higher pH, which is important if complete precipitation of iron is necessary. Obviously, from the above, it is not possible to offer any generalized recommendation on the subject.

Zinc Determination in Nickel Solution

Question: Is there any simple method to test for zinc in my nickel solution without having to purchase a spectro-photometer? I am not interested in determining the exact amount of zinc but in finding out whether I have dummied my tank sufficiently to reduce the zinc to a negligible concentration. Of course, I can tell from a test panel whether the zinc has been removed but I would prefer a chemical method.

A. R. L.

Answer: The method suggested by B. S. Evans should be satisfactory for your requirements. In this procedure, a suitable sample is treated with 10% potassium cyanide solution until the precipitate which forms just redissolves. Then 4 drops in excess are added. Allow to stand for one minute, then add 10 ml. acetone, shake well and let stand for 15 minutes. Add 20 ml. of a mixture of equal parts of

amyl alcohol and carbon tetrachloride, then 0.3 ml. of a 1½% solution of diphenylcarbazone in denatured alcohol and shake for about 15 seconds. A red color will appear if the zinc is over 0.1 g./l.

Since zinc ferrocyanide complex does not produce the red color, to determine the amount of zinc present the sample may be titrated with standard potassium ferrocyanide until the color disappears.

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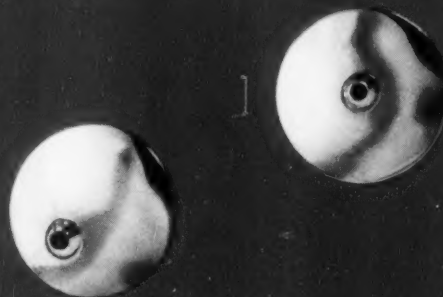
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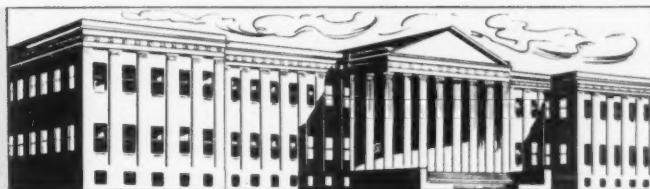
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Patents

RECENTLY GRANTED PATENTS IN THE METAL FINISHING FIELD



Gas Plating

*U. S. Patent 2,698,812. Jan. 4, 1955.
H. Schladitz.*

Process of depositing a uniform firmly adherent coating of metallic particles of finely divided sub-crystalline size upon the surface of a base material which comprises heating the surface of said base material in successive small increments of surface area to a substantially constant temperature and not substantially above the decomposition temperature of a heat decomposable metallic compound and projecting jets containing such decomposable metallic compound onto said heated surface to effect concomitant decomposition of said compound and coating of the surface, said heat and jets of metal compound being supplied to each small increment of surface area to be metallized in constant alternation and in rapid succession whereby the temperature of the surface being metallized is maintained evenly during the entire depositing process and the metal particles deposited on said surface are in sub-crystalline size.

Spot Plating Apparatus

*U. S. Patent 2,698,832. Jan. 4, 1955.
H. S. Swanson, assignor to Standard Process Corp.*

A portable apparatus for electroplating small discrete areas of a surface comprising a support having a handle thereon, a pair of receptacles mounted on said support in spaced relation adapted to be alternately held in a vertical relation one above the other by said support, a hollow body structure mounted on said support defining an electrolyte chamber, a wall on said body structure adapted to be pressed in sealed contact with a surface over an area to be plated and having an opening therein connecting said chamber and area to be plated, an anode mounted in said chamber, passage means in said body structure

operatively connected to said chamber, and conduit means operatively connecting said receptacles and passage means whereby an electrolyte is permitted to flow from the upper receptacle to said chamber to contact said anode and area to be plated and thence to said lower receptacle where said electrolyte is received prior to reversing the position of said receptacle for continued plating.

Polishing Machine

*U. S. Patent 2,699,016. Jan. 11, 1955.
G. G. Sherrill and D. W. Massey.*

An abrading and polishing machine comprising a frame, a shaft journaled in said frame, a rotatable abrasive surface fixed on said shaft, a rotatably mounted resilient pinch roll for guiding articles of various sizes and shapes into contact with said abrasive surface, means for driving said abrasive surface and said pinch roll, means for varying the speed of said pinch roll relative to said abrasive surface, means for reciprocating the shaft having the abrasive surface fixed thereon longitudinally of its axis relative to the pinch roll, said last named means comprising said shaft having a threaded reduced end portion, a bearing mounted on said end portion, said bearing having an annular peripheral groove in the inner surface thereof, a ball bearing assembly mounted in said groove and on said reduced end portion of the shaft and confined against longitudinal movement relative to said shaft, a yoke pivotally connected to said bearing, and driving means for reciprocating said yoke, said bearing and said shaft.

Contour Polishing Machine

*U. S. Patent 2,699,019. Jan. 11, 1955.
E. Dackor and E. F. Nelboeck, assignors to Thompson Products, Inc.*

In a machine for forming a surface on a work piece including a rigid former surface and an abrasive belt trained over said surface, guide pul-

leys on opposite sides of the former surface for guiding the belt thereacross, and adjustable mountings for said guide pulleys for tilting each of said guide pulleys relative to the former surface about an axis transverse to the axis thereof for directing the belt tangentially onto and off of the former surface.

Cleaning Platinum

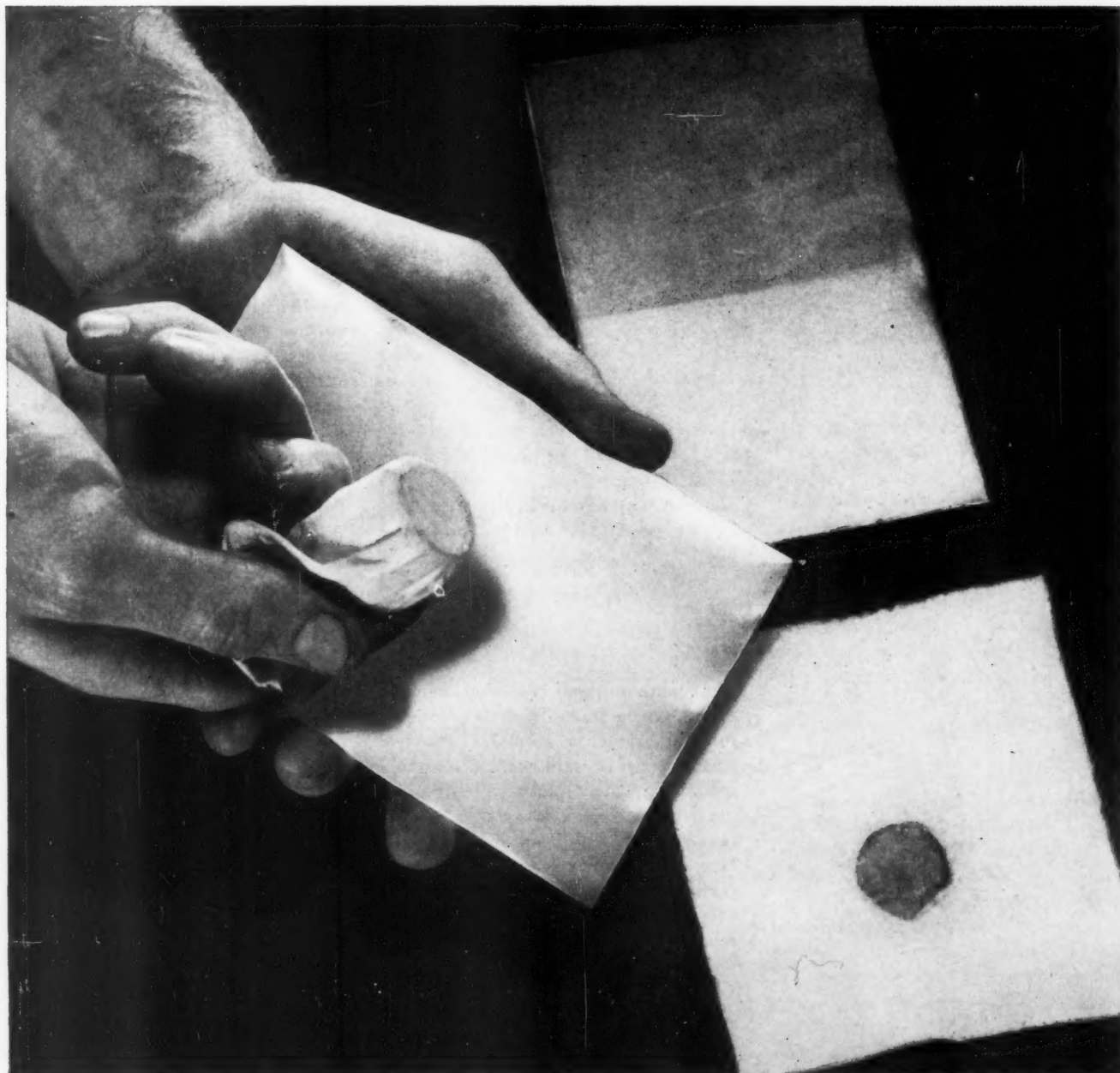
U. S. Patent 2,699,411. J. A. McHard and R. A. Winger, assignors to Dow Corning Corp.

A method which comprises contacting a platinum surface contaminated by a siliceous material with sulfur hexafluoride, at a temperature of from 500°C. to 1,100°C. whereby the siliceous material is removed from the platinum surface without substantial damage to or alteration of said platinum surface.

Electroformed Dies

*U. S. Patent 2,699,423. Jan. 11, 1955.
S. V. Lindbom, assignor to Husqvarna Vapenfabriks Aktiebolag.*

An improved method of manufacturing pressing tools comprising applying a covering layer to one side surface of a model of the article the configuration of which is to form the face of the tool so that a continuous shell is formed on said side surface, removing the model from the shell, electrically precipitating a continuous layer of relatively hard metal on the impression surface of said shell to form a duplicate of the model, removing said shell, applying a metallic backing to the surface of the duplicate opposite to that from which the shell had been removed, compressing and compacting iron powder against said duplicate on the side opposite to said backing and sintering said compacted iron powder to a body having an impression of the said one side surface of the model to produce a pressing tool of sintered iron powder having a posi-



Cloth on table reveals gloss-killing smut left on steel panel by old-style electrocleaner. Cloth in plater's hand shows virtual absence of smut on K-8-cleaned panel, assuring glossy, smooth plate.

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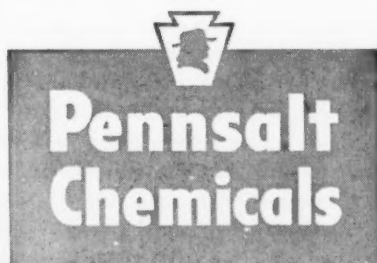
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tive duplicate of the model on its pressing face.

Printed Circuits

*U. S. Patent 2,699,424. Jan. 11, 1955.
T. Nieter, assignor to Motorola, Inc.*

A method of forming an electric conductor upon an insulating base which comprises the steps of coating the base with a layer of metallic silver, masking with a resist those areas of the base on which no conductor is desired, leaving unmasked the area on which a conductor is desired, electroplating copper onto the silver in the unmasked area of the coated base to form an electric conductor, removing the resist from the base, and applying sodium hypochlorite to the base for chemically converting the unplated parts of the silver to a non-conductive material.

Dross Remover

*U. S. Patent 2,699,933. Jan. 18, 1955.
J. T. Siefert, Sr., assignor to Northrop Aircraft, Inc.*

An implement for skimming dross from molten metal comprises: a generally rectangular grid having opposite faces, one of which is concave, and comprising a series of generally parallel, uniformly laterally spaced bars, and cross bars connecting the ends of said parallel bars, each of said bars being generally triangular in transverse section and presenting a sharp longitudinal edge to the concave face of said grid with side surfaces that diverge toward the other face of said grid.

Printed Circuits

*U. S. Patent 2,699,425. Jan. 11, 1955.
T. Nieter, assignor to Motorola, Inc.*

A process for forming electrical conductors upon both sides of a thin insulating panel which has a plurality of apertures therein with certain ones of the electrical conductors on at least one side of the panel being isolated from one another, and for forming conductive linings in the apertures adapted to receive terminal connections and adapted to interconnect certain ones of such conductors on opposite sides of the panel, which method includes spraying a metal compound solution and a reducing solution onto the surfaces of both sides of the panel and onto the bores of the apertures in the panel to coat such surfaces and

bores with a continuous metallic base layer, with the base layer forming a conductive lining for the apertures of a thickness small as compared with the cross-sectional dimensions of the respective apertures, applying resist material to said base layer on both sides of the panel to mask against electroplating portions of the surfaces thereof on which no final conductor is to appear and to leave uncovered the apertures and those portions of the surfaces on which final conductors are to appear with certain ones of the uncovered portions on at least one side of the panel being isolated from one another and with certain ones of the uncovered portions on both sides of the panel extending to corresponding ones of the apertures, coating a second metallic layer on said uncovered portions of said base layer by electroplating, with said second metallic layer extending through the apertures on the bores thereof and leaving an opening through each such aperture of sufficient size to receive the aforementioned terminal connections, and removing from the surfaces of the insulating panel said resist material and the portions of said metallic base layer underlying said resist material.

Method of Pickling Iron and Recovering Pickling Agent

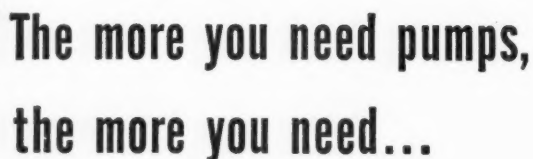
*U. S. Patent 2,700,004. Jan. 18, 1955.
C. O. Miller, assignor to Cleveland Industrial Research, Inc.*

A process for pickling ferrous metal which comprises the steps of immersing said metal in an aqueous pickling bath of ammonium acid sulphate to yield ferrous ammonium sulphate in aqueous solution, then by a process including the steps of oxidation and raising the pH to at least 7 with an ammonia-containing fluid, thereby converting said ferrous ammonium sulphate to oxide of iron and di-ammonium sulphate from the resulting solution, and heating said di-ammonium sulphate to convert it to ammonium acid sulphate and returning said ammonium acid sulphate to the pickling operation.

Acid Copper Plating

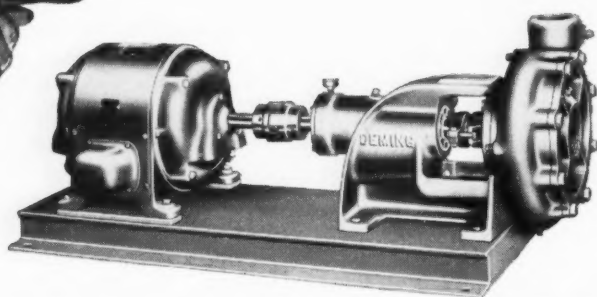
*U. S. Patent 2,700,019. Jan. 18, 1955.
G. W. Jernstedt and M. Ceresa, assignors to Westinghouse Electric Corp.*

An aqueous electroplating electrolyte comprising essentially copper sulfate, sulfuric acid, from 0.0005 to 0.05 ounce



DEMING

INDUSTRIAL PUMPS



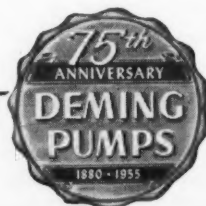
here's an example: Optional features of the Deming Fig. 4011 Centrifugal Pump (shown above) extend its scope of uses to handling a wide variety of different kinds of liquids . . . corrosive or non-corrosive. In many cases, this versatile pump eliminates the need for higher-cost pumps built entirely of corrosion-resistant metals. Other optional features include a choice of impellers and either stuffing box, or mechanical seal construction. BULLETIN No. 4011 explains this popular Deming Pump. Send for copy.

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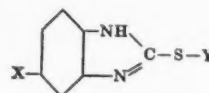


per gallon of at least one 2-thiohydantoin compound from effective amounts, up to 3 ounces per gallon of an organic carboxylic acid soluble in water, the organic carboxylic acid being selected from the group consisting of citric acid, malic acid, maleic acid, oxalic acid, adipic acid, and aconitic acid, and from 0.1 to 5 ounces per gallon of dextrin.

Bright Acid Copper

U. S. Patent 2,700,020, Jan. 18, 1955.
W. J. Pierce, assignor to Houdaille-Hershey Corp.

An electrolyte for the electrodeposition of copper consisting essentially of an aqueous sulfuric acid-copper sulfate bath, having dissolved therein, as a brightener, a compound having the following structure



wherein X is a monovalent radical selected from the group consisting of hydrogen and amino radicals and Y is selected from the group consisting of H and alkyl radicals having one to four C's, that compound having a concentration in the solution within the range of 0.005-1 gram per liter.

Burnishing Machine

U. S. Patent 2,700,254. Jan. 25, 1955.
C. C. Kinker and J. J. Murtagh, as-
signors to Gerity-Michigan Corp.

In a machine for burnishing metal articles, a container having a vertically disposed cylindrical side wall, a lining for said wall having pliant article rubbing projections on its inner surface, a liquid in the container having a suspended burnishing material therein, a vertical drive shaft centered in said container and extending above the container, means mounting said shaft for rotation in the container, a sleeve mounted on said shaft for rotation therewith and axial shifting movements thereon into and out of the container, means for driving said shaft and sleeve, arms turnable with and projecting outward from said sleeve, means at the outer ends of the arms for carrying articles to be burnished with the articles submerged in said liquid and in rubbing engagement with said projections when the sleeve is lowered to position the arms within the container and the shaft is rotated.

said arms and articles carried thereby being shiftable on the shaft to a position above the container to facilitate removal and replacement of the articles.

Indium Bonded Lubricant

*U. S. Patent 2,700,623. Jan. 25, 1955.
R. D. Hall, assignor to Electrofilm, Inc.*

A process for bonding solid lubricant to a non-ferrous metal friction surface which comprises applying thereto a thin coating of indium or an alloy thereof, heating said surface to bond said coating thereto by diffusion, applying to said coated surface finely divided solid lubricant suspended in an organic vehicle comprising a solution of an organic resin, allowing said second coating to air dry, and heating the coated surface to a temperature above the melting point of the coating metal to embed solid lubricant therein.

White Brass Bath

*U. S. Patent 2,700,646. Jan. 25, 1955.
A. E. Chester, assignor to Poor & Co.*

A plating bath comprising an alkaline zinc copper cyanide bath containing in solution dithiobiuret, the quantity of dithiobiuret being sufficient to extend the usable range of current densities at which white alloys of zinc and copper can be electrodeposited from said bath.

Emulsion Cleaner

*U. S. Patent 2,700,654. Jan. 25, 1955.
E. R. Holman, assignor to Turco Products, Inc.*

A liquid, metal cleaning composition consisting essentially of:

Per cent by weight

Ethylene diamine	About 12
Water	About 4
Neutral coal tar oil	About 68
Oleic acid	About 6
Pine oil	About 10

Corrosion Inhibiting Composition

*U. S. Patent 2,701,206. Feb. 1, 1955.
H. E. Fales.*

A corrosion inhibiting composition comprising approximately, by weight, 78% of a lower alkyl alcohol, 12% of a lower alkyl salicylate, 7.0% of mineral oil, .6% of an oleic acid soap, .5% camphor, .5% potassium iodide, .7% iodine crystals, and .7% of 28% ammonia water.



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Cadmium and zinc plating need not be dull and frosty. With Cadmax and Zimax, new brighteners distributed exclusively by Federated, cadmium and zinc plated parts are glossy and smooth.

These new Federated brighteners provide maximum throwing power, maximum coverage, maximum allowable current density, maximum brilliance and maximum luster. Zimax brighteners are available in both liquid and powder forms; Cadmax is available in liquid form only.

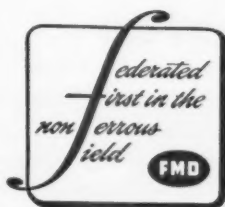
Ask your nearest Federated distributor to show you what Cadmax and Zimax will do. Or fill in the coupon below and we'll have a Federated sales engineer call on you from the nearest of our 13 plants and 23 sales offices.

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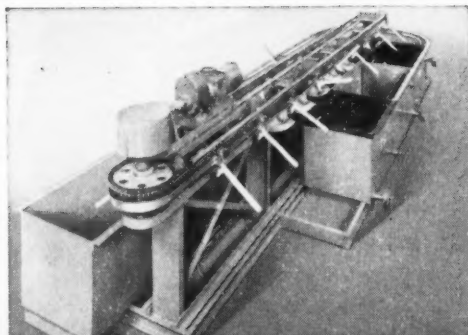
I want to know more about Cadmax and Zimax, your new cadmium and zinc plating brighteners. Please have a salesman call on me.

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Company.....

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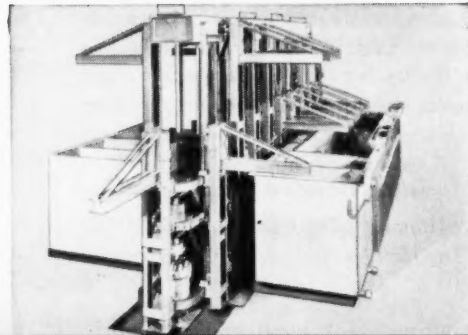
City.....Zone.....State.....



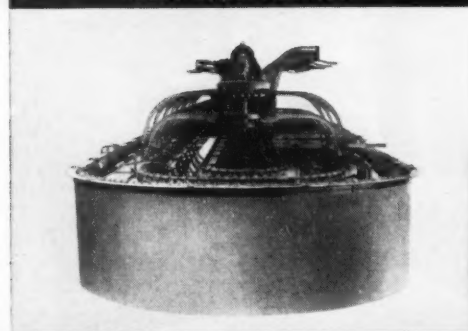
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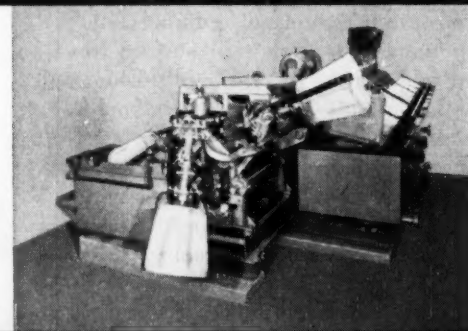
"STEVADOER"
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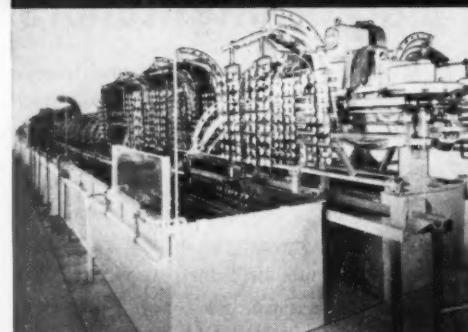
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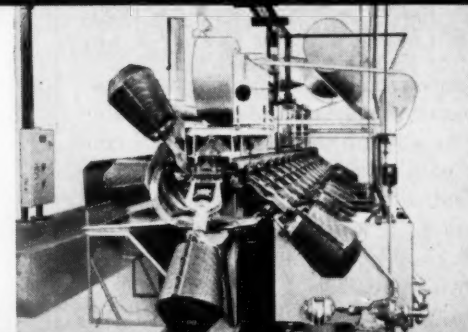
MODEL "C"
Barrel Type Machine



MODEL "B"
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Features rapid, continuous movement processing employing hump type cams. Design permits utmost mechanical and cycle flexibility.

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THE FINISHING TOUCH

VERSATILITY OF ALUMINUM FINISHES

by A. H. Kirkpatrick
Stevens Special Project Engineer

A look at the 1955 design engineer's drawing board leaves little doubt that aluminum is past adolescence.

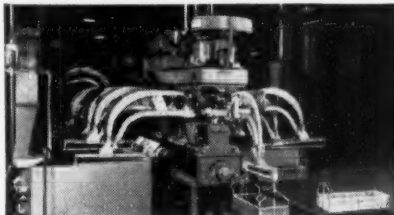
Aluminum responds to any number of finishing processes. Polishing and buffing will produce both satin and mirror bright finishes. Barrel Roto-Finishing will remove minor surface irregularities and improve the finish of small castings and forgings.

Stevens L. V.
Experimental
Aluminum Buffing
Operations.



Many chemical and electro-chemical immersion finishing processes, including anodic etching, electroplating, anodizing, electropolishing and bright dipping add versatility to the finishing of aluminum. In anodizing, dyes can be added for brilliant colored finishes.

Aluminum's coming of age makes the task of producing these aluminum finishes a real job for the project engineer.



Stevens Automatic Equipment
for bright dipping of aluminum.

Today, increased production, lowered costs and improved finishes, resulting from automatic, job-qualified, finishing installations are available to finishers of aluminum through Frederic B. Stevens, Inc. Stevens experience in the field of aluminum finishing ranges—

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Stevens can engineer and build complete automatic or still tank installations for any chemical or electro-immersion aluminum finishing process—furnish the supplies and equip your company to do the best job at lowest cost. If it's made of aluminum we know how to finish it. Call in your nearest Stevens representative or write direct to:



ABSTRACTS

Surface Removal with Chemical and Anodic Polishing of Reflectal and Pure Aluminum:

L. Koch and S. Keste: *Metall*, vol. 7, p. 577.

In continuation of previous work in which the smoothing and polishing of 99.99% aluminum by chemical and anodic polishing was investigated with the aid of electron microscopic examination, the examination was extended to the aluminum-magnesium alloy Reflectal and to 99.0% aluminum. It was found that the surface smoothing during the polishing proceeds practically in the same way with the alloy as with the 99.99% pure aluminum. With the 99.0% aluminum the surface process is disturbed by the occlusion of $Al_{12}SiFe_3$ crystallites. These are exposed by the polishing treatment and are partially anchored in the oxide skins produced during the processing. They become plastically visible by preferential material removal.

Roughness on Plating with High Current Densities—Causes and Prevention

A. F. Walter: *Metallwaren Industrie und Galvanotechnik*, vol. 45, No. 11, pp. 560 — 561.

The author discusses the practical aspects of the causes of surface roughness encountered when plating objects with a large surface area at high current densities. Objects of exceptionally large size were processed, comprising 270 sq. dm. in surface area. It was found difficult to apply current densities of more than 0.8 amp./sq. dm. as the parts became roughened in a hot copper and in a bright nickel bath to such an extent that the work was unacceptable. Continuous filtration was applied to the baths and only ware which was apparently clean was passed to the plating bath; care was also taken to exclude contamination by dust or dirt from the plating bath. The application of P. R. current did not prevent the roughness.

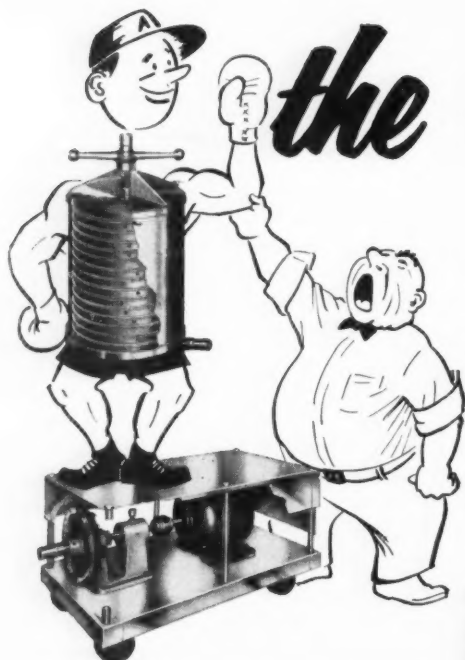
Discussing the possible causes of the roughness, it is stated that, first considering the problem broadly and excluding the size of the ware, the first fundamental postulation to make is that every correctly formulated bath will work in absolutely clean condi-

tions without any trouble, up to the highest permissible current density and will continue to work in this manner, provided that it does not become contaminated by the continuous entry of the ware. While with articles of relatively small dimensions it is not so vital to maintain the bath in such an absolutely clean condition, and greater latitude is permitted in this respect without running into very serious trouble, with larger size articles being plated, of the dimensions quoted, it becomes considerably more vital to maintain the bath working conditions very precisely.

Apart from roughness due to unsuitable bath dimensioning with large size articles or unsuitable racking, as a result of which the edges and corners become roughened and "burn," most of the trouble encountered can be traced back directly to bath contamination. It was found that foreign bodies have either found their way into the bath or have been formed or built-up in the bath. The main cause of bath contamination again, was traced back to the ware itself. Rolled edges and corners, and particularly recesses, cannot be cleaned with absolute certainty by organic degreasing agents, cathodic and anodic cleansing, etc. and, in addition, these cleaning agents themselves in turn may be trapped and not removed during the subsequent rinsing. For awkward shaped articles, likely to offend in this respect, it is recommended that mechanical cleaning be applied.

The question of bath build-up contamination is then discussed, such as anode decomposition and reaction products, which are usually oxides or hydroxides. Double bagging of the anodes is recommended to avoid roughness from this cause. In no circumstance should the surface of the bath be above the upper edge of the anode bags. Correct anode solution is also important to minimize this trouble, aided by suitable anode material and correct pH maintenance in the bath. It is necessary to test the pH both in the bath and in the anode bag. Frequently the difference will be found to be so great that hydroxides will separate out in the fabric.

Bad electrical insulation and defective maintenance of the bath can also be a source of roughness. Thus, heating coils, tempering indicating and control apparatus, faulty tank linings, etc. can get into a condition where they act as cathode co-conductors on which



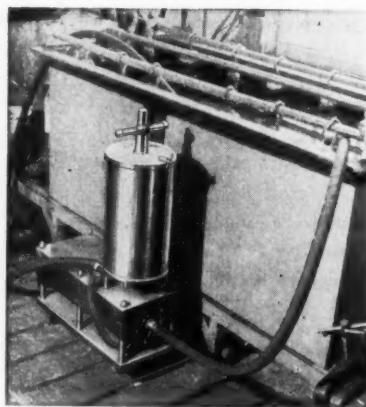
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loose and powdery metal will be deposited, which can again leave the surface and swirl about in the solution to be finally deposited on the plated ware as roughness.

Hard Chromium Plating of Needles—Racking Problems

Metallwaren Industrie und Galvanotechnik: vol. 45, No. 11, p. 561.

The problem of hard chromium plating of needles, as used in the textile industry, is discussed. First, the obvious solution of barrel plating to avoid the racking troubles with these needles, is dismissed as not being technically practicable. Racking of the needles in the usual still chromium plating tank by means of horseshoe magnets is then discussed; it is pointed out that this provides the best practical solution, as

racking by any other means with difficult objects of this type would hardly be possible. The use of permanent magnets for this purpose has proved satisfactory in practice. The magnets must be so positioned so that the needles are held in the direction of the lines of force field and, accordingly, the shape of the magnets will not act in a disadvantageous manner on the throwing power.

The use of a horseshoe magnet provides the best solution in this case. The needles are placed in the direction of the magnetic lines of force and adhere sufficiently firmly to the magnet. The contact provided is also sufficient for plating purposes. The magnet should not be excessively broad but should have a sufficiently large cross-section. A cross-section of 20 x 30 mm. is

advisable in this case, and the narrow side is on the inside (so as to ensure that too great a masking effect does not occur). The iron suspending wire is threaded in at the top at the bend of the magnets. The surfaces on which the needles are fixed must be ground flat so that a good transfer of the magnetic lines of force results and so that, in addition, a good contact surface is ensured for the plating current transfer. If plating is desired particularly at the points of the needles, then they are racked on the magnets at the opposite ends. In this way, about 28 needles of normal size can be hard chrome plated per charge and per magnet.

The magnets are provided with a suitable stop-off coating with the exception of the surfaces on to which the needles are to be placed. Here there is fastened a previously perforated cover band. With such a band, 3-4 chromium platings can be conducted. The band is then removed and a new one is placed in position in which the perforations are placed differently. In this way, 10 to 15 loads can be plated before the magnets have to be stripped.

The internal opening dimension of the magnets should be about 20 mm. larger than the length of the largest needle being handled. If the magnetization of the needles after they have been treated is undesirable, they must be subsequently de-magnetized in an alternating current field. The magnets must be designed so that they have a fore-shortened enclosed line-of-force field, and, from time to time, a subsequent magnetization will be necessary.

Embrittlement of Steel by Hydrogen during Electroplating

By U. Traegordh: *Iva* (Russia). Vol. 24, pp. 53-71.

Three spring steels which were very similar in composition but differed in their sensitivity to hydrogen embrittlement were plated with zinc coatings from various electrolytic baths (acid sulfate baths, fluoborate and perchlorate bath, alkaline cyanide, and zincate baths). The steels were pickled before plating and the embrittlement caused by the pickling was established and eliminated. The bend figure or the breaking angle served as the criterion for the embrittlement (Zapfe and Haslem test).

In the zinc sulfate bath, plating at 40°C. gave lower embrittlement than

at 20°C. An addition of potassium permanganate acted favorably with untreated or anodically pickled steel, and unfavorably with nitric acid-pickled as well as anodically pickled test pieces, stored for a longer time. Higher current densities also were found to promote the embrittlement, more dilute baths and thicker deposits. Test pieces with thick coatings from the fluoborate bath showed a rising embrittlement on storage. In the perchlorate baths the embrittlement rose with the current density but, on the other hand, did not in the alkaline baths. The lowest embrittlement was found with test pieces which had been pickled for a short time with nitric acid, and which had been plated in a perchlorate bath. A heat treatment at 145°C. is recommended to reduce the embrittlement.

Polishing Compositions Containing Silicone Oils

W. Burkart: *Metallwarenindustrie und Galvanotechnik*. Vol. 46, No. 1, pp. 34-35.

The general opinion is that silicone oils are harmful to plating processes and a simple test serves to confirm this. If, for example, a copper or steel sheet is rubbed with a commercial silicone oil, the sheet washed with trichlorethylene, electrolytically cleaned and then plated in a nickel or chromium bath, no satisfactory plated coating would be obtained in many cases. The reason is that buffed and polished surfaces often contain microscopic hairline cracks into which the silicone oil can penetrate.

As is known, silicone oils have a very low surface tension (about 21 dynes/cm) and, therefore, an outstanding wetting characteristic for metals. As a result they can penetrate into the minutest cracks and fissures and are held there by capillarity. Trichlorethylene will dissolve the silicone oil on the surface of the metal but, because of its much higher surface tension, cannot penetrate into the hairline cracks and remove the silicone oil there. Electrolytic cleaning also does not have a very much greater effect. These observations hold good for the application of pure silicone oils. It has been found by test that only a special choice of silicone oils is suitable for the preparation of sili-

cone oil-containing buffing compounds, if troubles of this nature are to be avoided. A satisfactory formulation involves the addition of a pretreated silicone oil of a definite composition and in definite amount to the polishing compound. The formulation, to be successful, requires that there be present waxes which serve to fix the silicone oil by their residual valency during solidification (van der Waals force). In order to render this fixing of the silicone oil onto these waxes as intensively effective as possible, care must be taken with the preparation of the composition that the cooling and solidification is conducted in a precise manner.

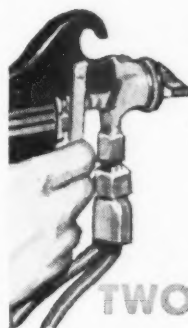
If metals are treated with silicone-

containing polishing compounds of this nature then it will be found that no adverse effects are encountered during plating. On the contrary, the advantages obtained are:

1. The brilliance is increased.
2. The polishing time is reduced.
3. The parts polished with the silicone-containing compounds, in most cases, can be better cleaned in trichlorethylene.

Finally, it can be said that it is only when haphazard choice and amount of silicone is made to a polishing compound that troubles are likely to be encountered; when a careful and judicious selection and addition is made as outlined above, then these troubles will not occur.

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Here's the *real* corrosion-protection you've been looking for — for tank exteriors, fume hoods, ducts — everywhere corrosive fumes play havoc with plating room equipment.

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and lets buffs live up to
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Check the other features of Liquimatic Liquid Buffing Compound... then write today for your free copy of Liquimatic's folder that tells the whole cost-saving story of Liquimatic in your buffing room.

Liquimatic ...

gives more buff mileage

These additional Liquimatic features mean real savings in terms of time, money, safety—

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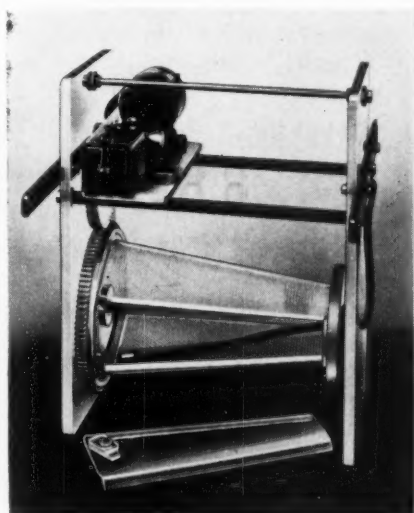
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NEW METHODS, MATERIALS AND EQUIPMENT
FOR THE METAL FINISHING INDUSTRIES



Tapered Lucite Plating Barrel

Belke Mfg. Co., Dept. MF, 947 N. Cicero Ave., Chicago 51, Ill.



Uniform plating of small odd-lot quantities ranging from a small handful to full capacity is claimed for new Porto-Platers with tapered cylinders.

The tapered cylinder concentrates the small load around the ball contact thereby avoiding the uneven deposit and partial plating that results when a small load is scattered the full length of conventional cylinders. The new odd-lot plater has "V" notched contacts that fit at any point on the cathode rod. A self-contained motor drive with reversing switch turns the cylinder in either direction and holds it in position for loading and unloading.

The cylinder of high temperature Lucite is free of ribs, tie rods and crevices. Attached Lucite cover locks cannot be misplaced or dropped into the tank.

The ball contact is mounted on a one-piece dangle cable. The geared head motor is for 115 v., 60 c., 1 ph., with plug connection. The cylinder at large end is 6" I.D. and 12" long. Plating capacity is 1/8 peck and empty weight is 28 lbs.

Further information may be obtained by writing to the manufacturer at the above address.

Non-Destructive Thickness Tester

Unit Process Assemblies, Inc., Dept. MF, 75 E. 4th St., New York, N. Y.

A new non-destructive thickness tester for the metal finishing industry permits inspection of 100% of production, and will test thicknesses of metals deposited on metals, metals on non-conductors, and non-conductors on metals.

This is the first non-destructive tester which will accurately give direct readings of thicknesses of virtually any coating on any base, including silver on brass, copper on die-castings, nickel on brass, metallizing on plastics, or metallic coatings on ceramics, etc., according to the above manufacturer.

The electronic unit is compact and



portable, permitting use in almost any location. Thicknesses are read directly from the instrument, and are determined in a matter of seconds.

Corrosion Resistant Coatings

Saran Protective Coatings Co., Dept. MF, Ferndale (Detroit) 20, Mich.

Just announced is a new chemical and corrosion resistant neoprene coating formulated from Du Pont neoprene and certain hardening resins which can be applied directly as received by the conventional methods of brush, roller, spray or dip. It requires no accelerator and no primer and has excellent adhesion to all clean dry surfaces, rigid or flexible as for example: masonry, wood, metal, fabric and rub-

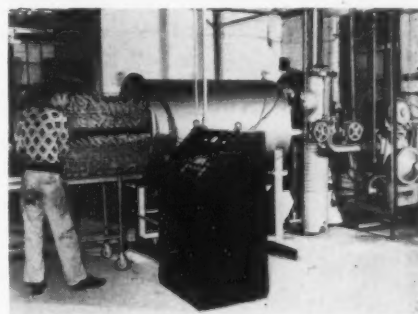
ber. Coat thickness is from 2 to 3 mils which dries dust free in 30 minutes and can be put in service overnight. Since the film is substantially free of pin holes, two coats will, in most cases, give adequate protection against corrosive and chemical action. Drying time of 2 to 4 hours is recommended between coats.

According to the above manufacturer, it provides a highly acid and alkali resistant surface which is tough, resilient, abrasion resistant, non-oxidizing, cushioning and extremely long wearing. It inhibits the galvanic action set up between dissimilar metals and withstands high heat (to 350° intermittently) without damage. At present, it is being produced in Black, Gray, Red, Green and Aluminum.

Pumps for Vacuum Metallizing

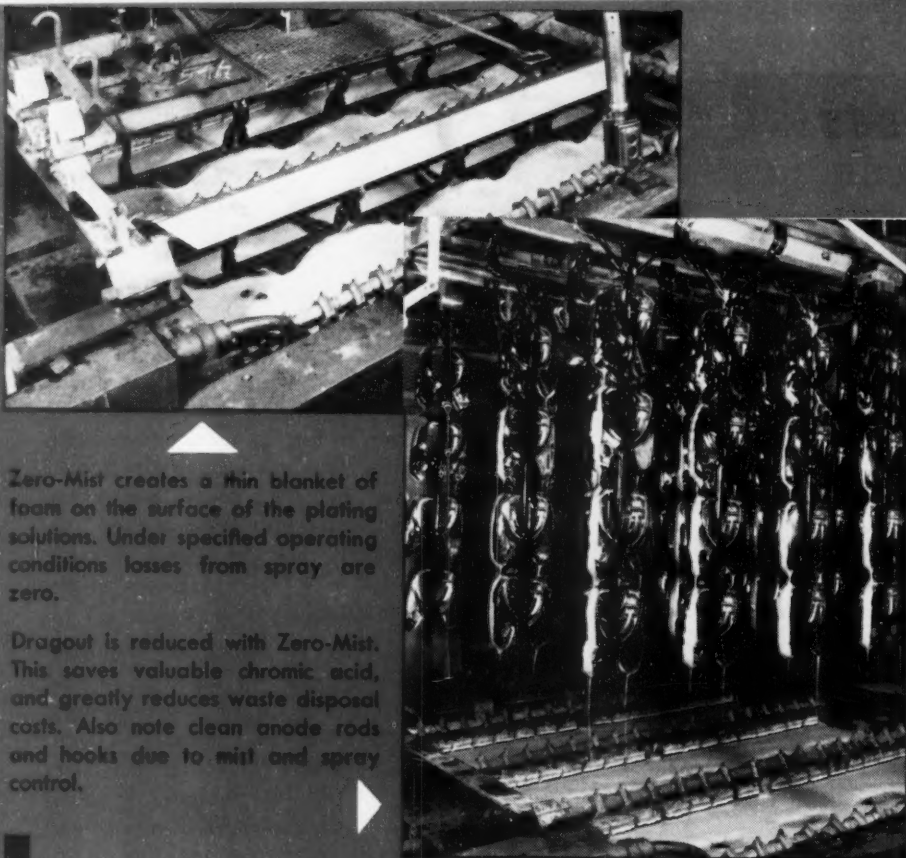
F. J. Stokes Machine Co., Inc., Dept. MF, 5500 Tabor Road, Philadelphia 20, Pa.

Shorter production cycles resulting from faster pump-down of vacuum metallizing chambers are claimed to be possible with the new "Ring-Jet" diffusion and booster pumps recently introduced by the above company.



A Stokes 14-inch "Ring-Pet" diffusion pump gives rapid pump-down of this 36-inch vacuum metallizing unit at Vacuum Plating Corp., Bronx, N. Y.

The new pumps incorporate a revolutionary design feature in which a ring of jets replaces the jet cone of conventional diffusion and booster pumps. This ring of jets permits the



Zero-Mist creates a thin blanket of foam on the surface of the plating solutions. Under specified operating conditions losses from spray are zero.

Dragout is reduced with Zero-Mist. This saves valuable chromic acid, and greatly reduces waste disposal costs. Also note clean anode rods and hooks due to mist and spray control.

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*Get a free sample of ZERO-MIST
for an easy test in your own shop*

Now you can make your own simple test of Zero-Mist—the magic new product which controls mist and spray in chrome plating baths. Udyllite is making this offer to familiarize chrome platers with the many advantages of Zero-Mist.

Many chrome platers are now using Zero-Mist with amazing results. Here's what it will do for you: give absolute control of chromic acid mist and spray saving up to 30% of chromic acid loss through the ventilating ducts—reduce the workroom air pollution—cut dragout losses—lessen pollution of rinse water—save on maintenance of existing hoods, ducts and fans used in ventilating systems—cut your chromic acid losses from mist, spray and dragout up to 70%.

Write for a Zero-Mist sample today. We will send it to you free with complete instructions for an easy small scale test in your own shop. Fill out coupon below.

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CORPORATION
DETROIT 11, MICHIGAN

Please send a free sample of Zero-Mist with instructions which will enable us to make our own test. Mail to:

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STREET _____ ZONE _____
CITY _____ STATE _____

cross-sectional area of the air-flow path to be substantially increased, thus greatly increasing the volume of air that can be passed through the pump and hence increasing its pumping speed. Size for size, this exclusive feature increases the pumping speed of the new pumps by from 10% to more than 100% over conventional pumps of similar dimensions and heat input. Sizes range from 4"-16".

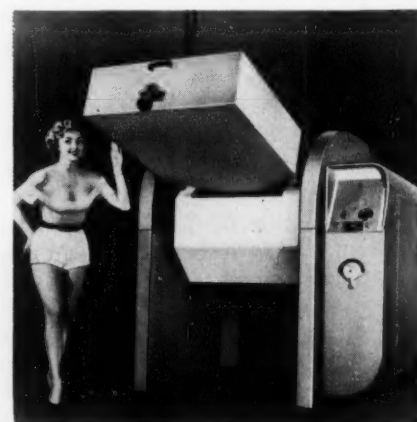
Pumping speed curves, throughout curves and fore-pressure tolerance curves for each of the several sizes of "Ring-Jet" diffusion and booster pumps are given in a series of bulletins just issued by the company.

Barrel Finishing Equipment

*Speed-D-Burr Corp., Dept. MF,
3613 San Fernando Road, Glendale
4, Cal.*

The "Futurama" Series has been designed to modernize, add prestige and unparalleled efficiency to plant deburring and finishing departments in the barrel finishing of small precision parts or large intricate forgings, castings, etc. Equipment of this type has in the past shown production savings of 80% or more over other methods of parts finishing.

Available in six different models and sizes, the series is designed to offer a model for almost every industrial barrel finishing requirement. The deluxe model comes in two sizes, 36" x 32" or 24" x 24", either one or two compartment style. Particularly suited for handling high production needs or processing large work loads, this unit comes equipped with 1½ H.P. variable speed motor. A standard model in 36" x 32" or 24" x 24", 1 or 2 compartment, is also available as is the economy model in the same sizes. The line also includes a hot sawdust barrel used for drying, polishing, and waxing.





This model comes in the deluxe, standard and economy models.

Among the many luxury features found in the new series is the "swing-away" safety hood which protects the operator at all times. It is so pivoted that smooth easy action is possible even by female workers. A low voltage electronic control panel gives the operator absolute control over the barrel at all times and assures greater safety. The quick acting cam locks and hinged door reduce opening and closing time 90% over other available types of doors and eliminates the needs of fumbling for door, locking wrenches, bars, et., according to the manufacturer.

All units are constructed of heavy gauge steel of aircraft design for strength and rigidity. The cabinets are finished in a restful vista green color. All barrels are of heavy gauge steel, all-welded construction, watertight seal and finished in focal yellow as an added safety feature. Motor and control panels have been placed on the side at proper operating level for the operator's convenience and safety.

National sales are planned through regional distributors. Inquiries are invited.

Cold Cleaning Compound Also Acts as Rust Inhibitor

*International Chemical Company,
Inc., Dept. MF, 2628 N. Mascher St.,
Philadelphia 33, Pa.*

Metal parts are said to be efficiently cold cleaned before inspection, storing or further processing through the use of a formulated cleanser produced by the above company.

Called International Compound No. 504, this cold cleaner is primarily intended for use diluted with water in pressure spray power washing ma-

**COMING
SOON!!**

THE CYCLEMASTER

UDYLITE'S NEW AUTOMATIC PLATING MACHINE

OFFERS • HIGHER PRODUCTION
PERMITS • GREATER VARIETY OF PROCESSES
USES • MINIMUM FLOOR SPACE

WATCH FOR IT!

THE
Udylite
CORPORATION
DETROIT 11, MICHIGAN

Extra-at no extra cost

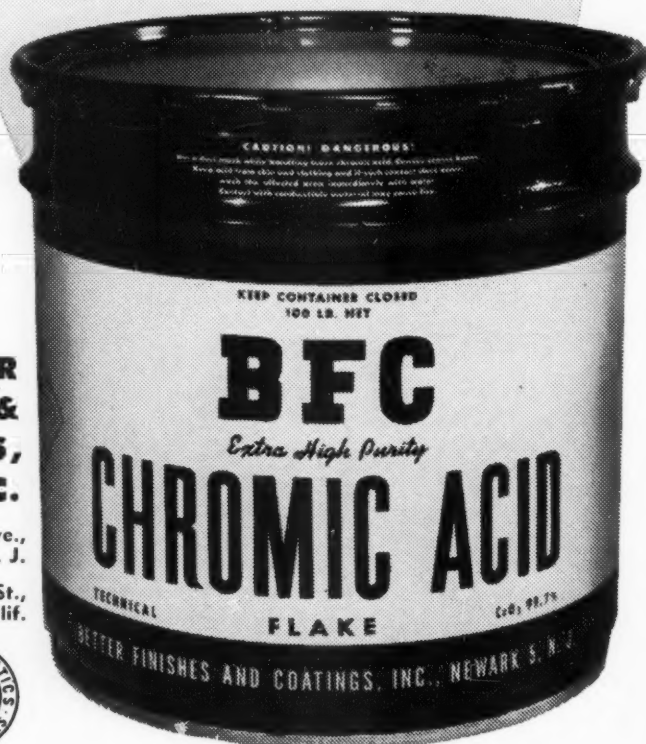
We offer product-quality above the industry standard, the interested attention of owner-managers and heads-up local service by as fine a line-up of distributors any manufacturer can have.

If these "extras" appeal to you, we'd like to have a modest order when you're in the market. We are sure you'll appreciate the quality of BFC Chromic Acid and the nice, friendly way we do business.

**BETTER
FINISHES &
COATINGS,
INC.**

268 Doremus Ave.,
Newark 5, N. J.

2014 East 15th St.,
Los Angeles 21, Calif.



chines. Wherever used it is said to save the time and expense involved in heating solutions and maintaining them at higher temperatures. Too, it eliminates discomfort to workers often caused by pressure spray cleaning at high temperatures.

A concentrated liquid mixture of detergents, wetting agents, high solvency power naphthas and solvents, rust inhibitors and emulsifiers, compound No. 504 also is said to provide a temporary rust preventive by forming an inhibitive film over cleaned parts.

Buffing Compound

Russell H. Burns Compound Co.,
Dept. MF, Middlesex, N. J.

A new red oxide buffing compound,

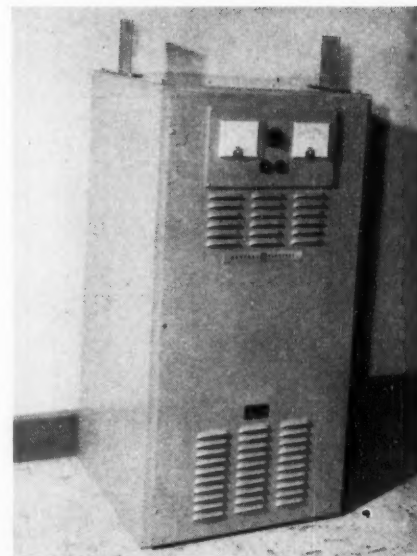
for producing a bright golden finish on copper or copper plate has been trademarked Colorcopper. The new compound is a combination of specially processed iron oxide and saponifiable wax. Cakes are molded in individual trays as a safeguard against breakage during shipment.

1000-Amp. Germanium Plater

Rectifier Dept., General Electric Co.,
Dept. MF, Lynn, Mass.

A new 1000-ampere germanium plating rectifier has a number of advanced features that will help users save money on installation, operation and maintenance cost.

Compact and lightweight, the units need no special foundations. Operating costs are greatly reduced by german-



ium's high over-all conversion efficiency. A minimum of moving parts and an absence of aging in the elements assures extremely low maintenance costs.

Down-draft air cooling, in which air is drawn in horizontally through the front panel, minimizes dust and dirt intake. Single knob, fingertip control simplifies adjustment and also eliminates multi-knob turning. Complete control flexibility with the new plating power supply permits the addition of automatic control in the future without complete replacement of the manual control.

**Trouble Shooting Charts for
Electroplaters**

Joseph B. Kushner Electroplating
School, Dept. MF, 115 Broad St.,
Stroudsburg, Pa.

The Tank Doctor, a copyrighted, new type of trouble shooting chart for electroplaters and plating department control chemists, gives in systematic order, the symptoms, the diagnoses and cures of and for practically any difficulty that can come up in the operation of the specific tank for which it is designed. The chart size is 8" x 10" so that it is quickly scanned by the eye, yet it is extremely comprehensive in detail. The print is easy to read, the instructions easy to follow, according to claims.

The charts are printed on rigid, opaque white vinylite sheet stock, which makes them impervious to water, fumes, and the acids, chemicals and alkalies commonly found in the plating room. In addition the print is protected by an overlay of transparent vinylite inseparably bonded to the

opaque base, so that print cannot be rubbed off. The only care required is an occasional wipe with a damp cloth.

The chart was designed so that it can be permanently mounted right at the plating tank or control panel for instant convenient consultation or reference. This location at the point of use where the troubles arise, permits the operator or control chemist to take immediate action in rectifying any difficulty, thus saving time and labor and permitting the production to go on with a minimum of interruption.

Available for immediate delivery are the Chromium Tank Doctor which covers both decorative and hard chromium baths, the Nickel Tank Doctor which covers bright nickel and Watts baths, and the Copper Tank Doctor which covers rochelle and high efficiency cyanide baths.

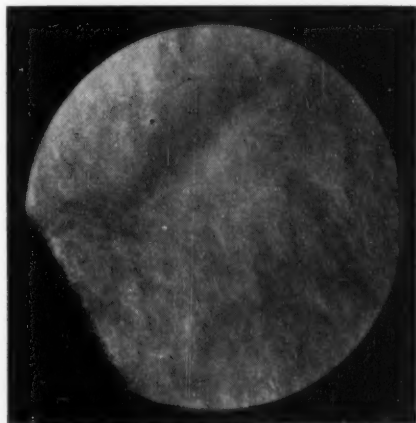
Dynel Filter Felt

Filtration Fabrics Div., Filtration Engineers Inc., Dept. MF, 155 Oraton St., Newark 4, N. J.

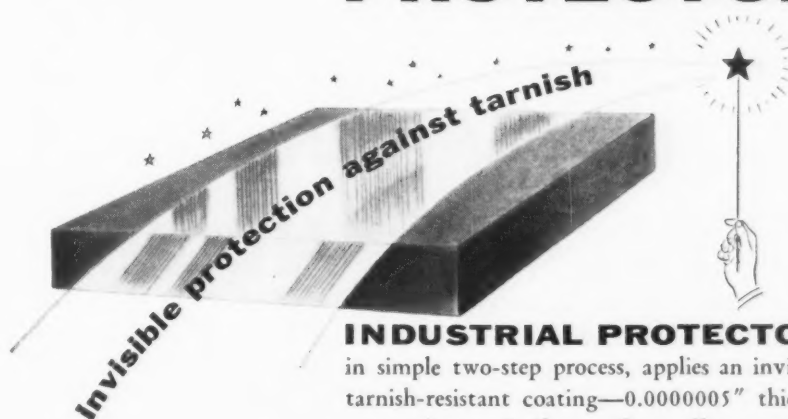
A new Feon chemical-resistant synthetic filter felt, made of tightly compacted resin-bonded fibers of Dynel, has been announced.

The material is virtually unaffected by most concentrated mineral acids and bases, and is claimed to be very highly resistant to a variety of organic acids, bases and salts. The new felt is easy to clean, and has a structure which retains fine solids yet has a relatively high porosity permitting high filtering rates.

In its manufacture, short fibers of Dynel are carded in both directions to give greater strength, dimensional stability, and smoothness. The fibers are treated with a resin binder. After



Technic INDUSTRIAL PROTECTOX



Protectox treated surfaces are easily soldered—treated contacts may be built into relays and other equipment without pretreatment or after treatment. Send for "Industrial Protectox" Data Sheet—full details, application procedures, cost, etc.

INDUSTRIAL PROTECTOX, in simple two-step process, applies an invisible tarnish-resistant coating—0.0000005" thick—on surfaces of silver, silver alloy, copper, brass, gold.

- ★ Anti-tarnish for work in open trays, storage, shipment
- ★ Resistance to sulphur fumes, other industrial atmospheres
- ★ Excellent lacquer base, improves adherence 300%
- ★ Film easily removed without pretreatment when desired

TECHNIC INC.

Providence 1, Rhode Island, U. S. A.
JACKSON 1-4200



THE LARGEST ENTERPRISE OF ITS KIND IN THE WORLD

USE THIS COUPON

TECHNIC INC., 39 Snow St., Providence, R. I.

Please send "Industrial Protectox" Data Sheet.

Name and Title

Company

Address

felting, the bond is "set" under heat and pressure to give a dense, strong, smooth-surfaced filter cloth. An advantage is that the bonding resin is Vinyon, the same basic material as the Dynel, and will withstand any chemicals for which Dynel itself is suitable.

The felts have greater chemical resistance than previously available wool felts, do not shrink, and because they keep their shape they are easier to fit in the presses. Maximum temperature is 170 deg. F. They can be sealed in press frames without "rim cutting." These felts have bursting wet strengths of from 200-350 lbs. per sq. in., which is more than required for filtering applications.

Thermodynamic Steam Trap

Sarco Company, Inc., Dept. MF, Empire State Building New York 1, N. Y.

Type TD-50 steam trap, for pressures 10-600 p.s.i., is a new addition to the above company's thermodynamic steam trap line introduced last November. These revolutionary new type traps, patent pending, use the thermodynamic energy of steam to close the valve.

There is no need for plants to carry a large inventory of steam traps for various pressures because the trap, without any changes, can be used on any pressure, 10-600 p.s.i. In addition,

New discovery solves acid copper plating problems...cuts plating costs

NEW ANACONDA "PLUS-4" ANODES (PHOSPHORIZED COPPER)

WHY PLATING WITH "PLUS-4" ANODES COSTS LESS!

- + 1 no anode sludge
- + 2 no copper "build-up" in solution
- + 3 smooth, heavy cathode deposits (no "bagging" or diaphragms required)
- + 4 up to 15% more cathode deposit per anode

more uniformly, leaving a small, compact "fish"—providing an additional saving in scrap loss. ANACONDA "Plus-4" Anodes are made in all standard sizes and shapes . . . cost no more than ordinary rolled anodes.

SPECIAL TRIAL ORDER—

For details on how you can get a test supply of "Plus-4" Anodes sufficient to fill one tank, write to *The American Brass Company, Waterbury 20, Conn.* In Canada: *Anaconda American Brass Ltd., New Toronto, Ont.*

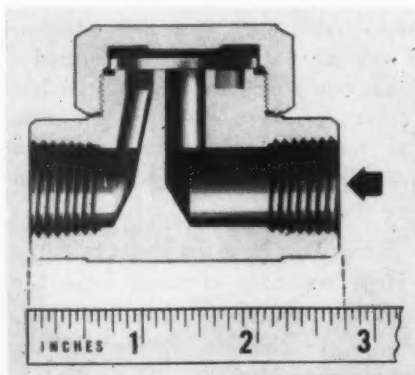
*For use under Patent No. 2,689,216

55145

"PLUS-4" ANODES
AN
ANACONDA®
PRODUCT
made by The American Brass Company

the same trap operates equally well on light or heavy loads and closes tight on no load. It operates against back pressures up to 50% of the inlet pressure.

Machined from stainless steel bar



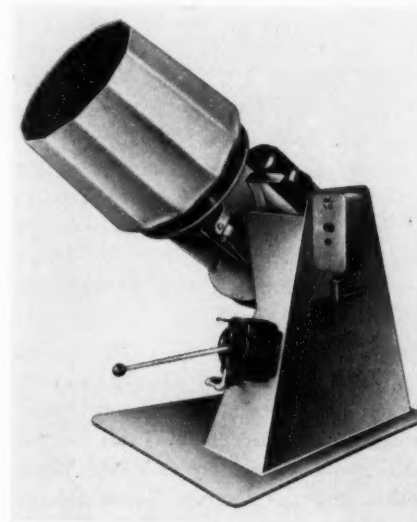
stock, this new trap consists of only three parts: body, screwed cap and the valve head, a solid stainless steel disc. Very compact: only 1 3/4" x 2 1/8" x 2 3/4".

The manufacturer claims there is practically no need for maintenance because of the unique design and all stainless steel construction. Because the trap is all stainless steel, it resists both internal and external corrosion. Furthermore, this new steam trap is not affected by water-hammer or vibration and is freeze-proof when installed in a vertical line with an open discharge line.

The trap discharges at saturated steam temperature and has a high air venting capacity.

Tilting Tumbling Machines

The Baird Machine Co., Dept. MF, Stratford, Conn.



The Model H oblique tilting machine introduces new features and refinements of design that improve operation and add high degrees of safety and convenience for the operator. There are few moving parts; controls and adjustments are conveniently located and bottle barrels are easily emptied by manual-hydraulic or power tilting. Little floor space is needed and machine is offset on base for solidity. Motor acts as balance for load. Barrels of different shapes and materials may be mounted on the machine to suit the user's requirements.

Black Crepe Paper Masking Tape

Permaceel Tape Corp., Dept. MF, New Brunswick, N. J.

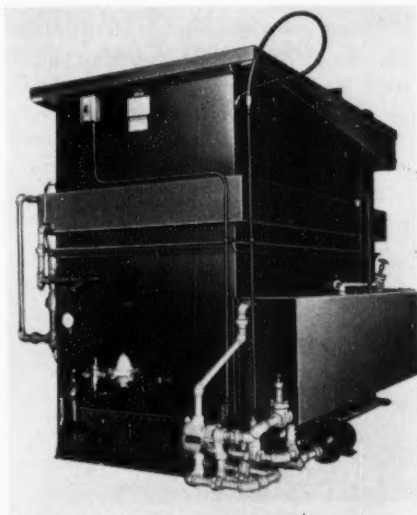
Constructed with a transparent adhesive and semi-gloss, flattened crepe backing, Permaceel 717 is designed for all purpose use in plant work. The tape's smooth backing combined with easy release from the roll makes for simple application without finger abrasion, according to the above manufacturer.

It's firm, heat-resistant adhesive holds at normal or forced drying oven temperatures and releases without adhesive transfer on removal from the job. Its masking range is from 50°F. to 240°F.

The firmness of the adhesive is designed to prevent cold flow, eliminating the development of sticky tape edges when applied to a panel, even with moderately high pressure over long periods of time.

Heavy Duty Vapor Degreaser Features Special Sludge Sump

Phillips Manufacturing Company,
Dept. MF, 3473 West Touhy Ave.,
Chicago 45, Ill.



A new series of electric, gas or steam heated heavy duty degreasers has been designed to meet the need for degreasing parts or assemblies heavily laden with very thick soil, soluble, insoluble, or both. This new heavy duty degreaser has been developed in order to solve the problem of draining off heavily contaminated vapor degreasing solvent, permitting longer operation between cleanout periods.

A unique double sump provides the key to the heavy duty feature of the machine. One of the sumps contains the heating element which brings the solvent to a boil. The other sump is a repository for the contaminated solvent which runs off from a drain plate above the boiling sump. A removable sludge pan is located in this settling sump. Heavy particles settle out into the sludge pan, leaving the relatively clean solvent free to return to the boiling sump for reuse. The sludge pan can be removed, emptied and replaced with a minimum interruption in work. A flusher pump and spray can be installed to flush out soil from recesses in the parts.

The new units are available in four different standard sizes, handling work requirements from 4,000 to 12,000 pounds per hour. Special sizes and requirements can be made to order. A constant level solvent control admits clean solvent as required from the storage tank. A piping by-pass permits rapid recharge of the degreaser.

The only filter on the market you can **LEARN TO OPERATE IN ONE MINUTE!**
CLEAN COMPLETELY IN LESS THAN 15 MINUTES!

Sel-Rex

DOUBLE DUTY FILTERS

Cuts filter cleaning time to less than 15 minutes

No filter on the market can be completely cleaned and reassembled as fast as a Sel-Rex DOUBLE DUTY Filter.

The entire Annular element is secured to the tank cover—lifts out freely and easily for cleaning, either by hand or with the sturdy, hand-operated davit mounted on the tank of larger units. Messy handling of wet and dirty elements is eliminated—you can even clean an element used for carbon treatment without soiling your hands!

Other outstanding advantages:

Completely new Sel-Rex-designed mechanical seal pump sharply reduces maintenance. Pump seal replacement method has been simplified.

The compact design saves valuable shop space... the new Annular element gives DOUBLE the amount of filtration area and speed in the same space required by other filters. All Sel-Rex DOUBLE DUTY Filters can be used with either the new Annular element or porous stone—no additional parts are required for conversion.

Standard models from 250-18,000 GPH capacity.

Larger models built to specification.

So simple to operate —
You can learn to perform ALL filtering operations in less than ONE minute—precoat... filtering... backwashing... or liquid transfer—even if you've never operated a filter before. Simplified, easy-to-read instructions are fastened to the front of the tank—can be read when operating valves are used. Valves are conveniently located, colored and numbered for quick identification.

WRITE TODAY FOR ADDITIONAL
INFORMATION OR QUOTATION



BART-MESSING CORPORATION

229 Main Street, Belleville 9, New Jersey

Vapor level is controlled by means of a water jacket. Automatic shut-off controls for protection against overheating are provided where required. The units are of arc-welded steel plate constructions reinforced, metallized and painted on the exterior with solvent resistant paint.

Rubberized Abrasives Kit

Cratex Mfg. Co., Dept. MF, 81 Natoma St., San Francisco 5, Cal.

The new kit contains an assortment of 24 of the most popular Cratex polishing wheels, cones, blocks and mandrels which are in wide use in industry for cleaning and polishing.

Each polishing kit contains full instructions on the application of rub-

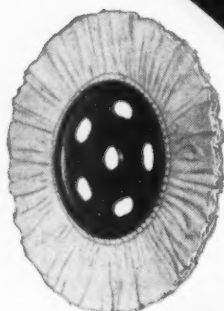
berized abrasives in burring, smoothing and polishing on hard or soft metals, plastics, ceramics, glass and other materials. The kit is sold at \$12.50 at industrial supply distribu-



FORMAX

the Perfect Combination

**FROM START
TO FINISH**



**ZIPPO
CLOTH
BUFFS**

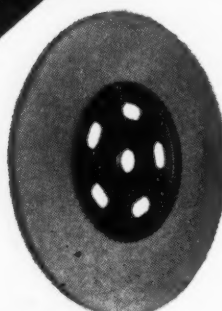
These famous long-wearing buffs run cool under all buffing conditions. High count bias-cut cloth is assembled on ventilated steel centers. Each section is perfectly balanced and faced—requires no raking.



**BUFFING
COMPOUNDS**

Formax produces a complete line of buffing compounds in bar, tube and liquid form.

Our extensive manufacturing, laboratory and testing facilities are at your disposal.



**ZIPPO
SISAL
BUFFS**

You have a pleasant surprise coming if you haven't tried the new Zippo bias-type sisal buff. It was specifically developed for steel buffing—to blend polishing grit lines—to cut down stainless steel—and bring up a bright lustre.

Other Formax products include the well-known C-20 Flexible Contact Wheels and F-26 Abrasive Belt Grease Stick.

Descriptive Catalogs Sent on Request

FORMAX MFG. CORP.

DETROIT 7, MICHIGAN

"THE FOUR McALEERS"

tors—or may be ordered direct from the company.

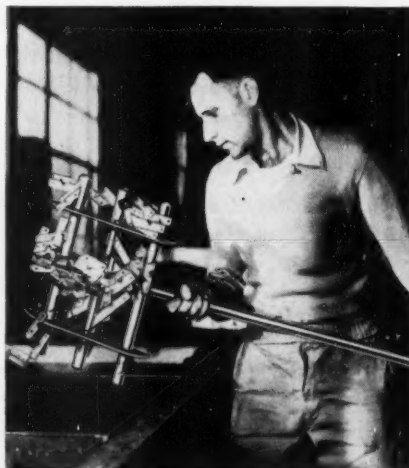
Dip Tank Magnet

Eriez Mfg. Co., Dept. MF, Erie, Pa.

The new permanent, non-electric dip tank magnet is a powerful magnetic tool designed for retrieving ferrous materials from or dipping metal into all types of tanks, basins or troughs. It is particularly useful where hot liquids or corrosive acids are used because a worker's hands do not need to come in contact with the dangerous material involved.

The potent permanent Alnico V magnetic element is encased in three stainless steel tubes which are mounted on non-magnetic runners, allowing the tool to be swept across the bottom of

the tank and yet not attach itself to the bottom of the tank or trough. The metal adhering to the magnetic unit is easily and quickly cleaned off be-



cause the tubes are smooth stainless steel.

A tubular 8 foot handle is attached to the "Octopus" by a cotter pin which permits easy removal, if desired.

The permanently guaranteed magnetic power is capable of lifting and holding metallic objects and masses weighing 75 to 100 pounds, yet the tool itself weighs only 9½ pounds, and is approximately 12" square.

Adapter for pH Meters

Photovolt Corporation, Dept. MF, 95 Madison Ave., New York 16, N. Y.



A new swing-arm adapter is designed for convenient pH measurements on small liquid volumes and assures safe positioning of the fragile electrode tips in tiny beakers. This is achieved by immersing the electrodes by simple tilting action always in exactly the same reproducible position.

The swing-arm adapter is intended to be attached to all Photovolt pH Meters (Models 110, 115, 125, and 125-B), and primarily to be used with the company's electrodes. Yet, it is so designed that a number of electrodes of other similarly popular makes can also be attached.

Detergent for Oily Soils

Kelite Corp., Dept. MF, 1250 N. Main St., Los Angeles 12, Cal.

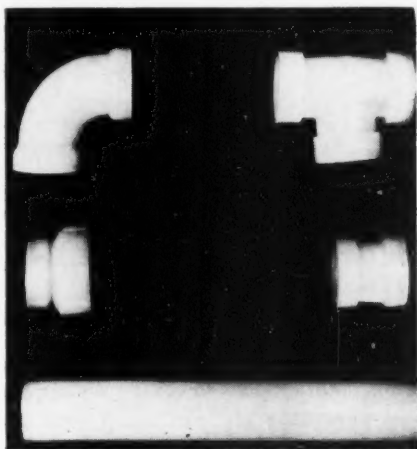
Supersolv, a new patented granular type industrial detergent composition effectively removes petroleum oils and greases from both solid and porous surfaces, and is claimed to be superior to solvents and strongly alkaline products heretofore used. Oily soils are removed by displacement. Further, once removed, they will not deposit even though the surface is not rinsed. Rate of soil removal is increased by heat, although the material does an excellent job as a cold solution.

The detergent may be used in cold

or hot solutions, and in steam or vapor cleaning. Two pounds per 25 gallons in steam cleaning equipment removes oil, grease and accumulated soils quickly and safely from all surfaces including aluminum and painted surfaces. The vapors are non-toxic, non-corrosive, and non-flammable. It is stated to be harmless to paint, clothing, shoes, mops, brushes and galvanized and aluminum equipment.

Polyethylene Fittings and Pipe

Arthur S. LaPine & Co., Dept. MF,
6001 South Knox Ave., Chicago 29,
Ill.



The above company announces the addition of two complete lines of polyethylene fittings: a line of threaded fittings and a line of sleeve fittings. Each line includes elbow bends, short tees, swept tees and swept bends. The threaded line also includes a half coupler with a male thread and a half coupler with a loose nut. There is also a blanked screw cap for cleaning. A stainless steel band clamp is available for connecting sleeve fittings.

One and three-quarter inch O. D. pipe is furnished in lengths of 1-foot and 6-foot. All fittings and pipe are 1½" I. D. (actual dimension, not nominal) and are interchangeable. They are made of natural white polyethylene.

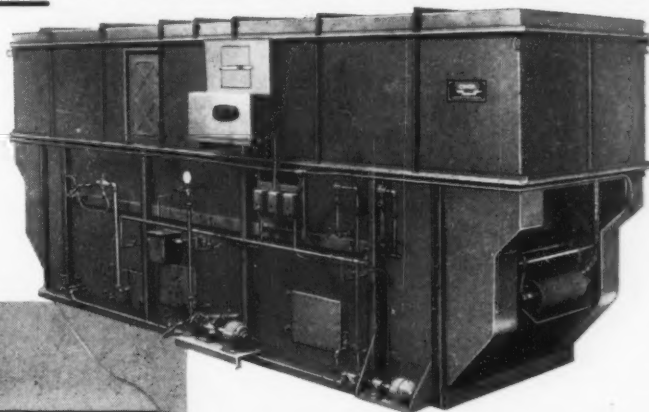
Portable Brinell Hardness Tester

Andrew King, Dept. MF, Box 606,
Ardmore, Pa.

Ferrous metals in regular and irregular shapes can be tested for hardness at the bench or almost anywhere in or out of the plant, storage rack or machines with the portable Brinell hardness tester recently developed. Accuracy of the precision unit is guaranteed to well within ASTM require-

Scrubs out the last speck of **DIRT** **CIRCOSONIC ULTRASONIC DEGREASER**

Typical Circo conveyor type vapor degreaser with integral ultrasonic chamber.



... Low frequency Transducers make the difference!

Use Circosonic whenever cleanliness must meet stringent industrial or military standards. New transducer operates at lower frequency which cuts shadow effect so that ultrasonic waves curve around corners . . . remove every last speck of oil, grease, lapping compound and dirt from deepest recesses and capillaries as no other method can do. New shape beams sound energy

over wider area . . . requires no critical positioning when cleaning small parts like bearings and electronic components . . . extends to any desired length for large shapes like transmission pumps and gears. Circosonic units provide new standards of cleanliness while cutting cleaning time from hours to seconds . . . may also be integrated into existing cleaning equipment.

SINCE 1923

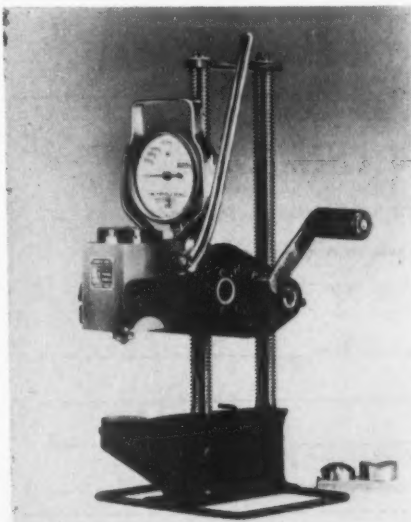
CIRCO
EQUIPMENT COMPANY

MANY STANDARD MODELS . . .

Units from 500 watts to 25 kw. Available separately or integrated with Circo Vapor Degreasers, conveyorized or hand operated. All backed by nationwide technical field service.

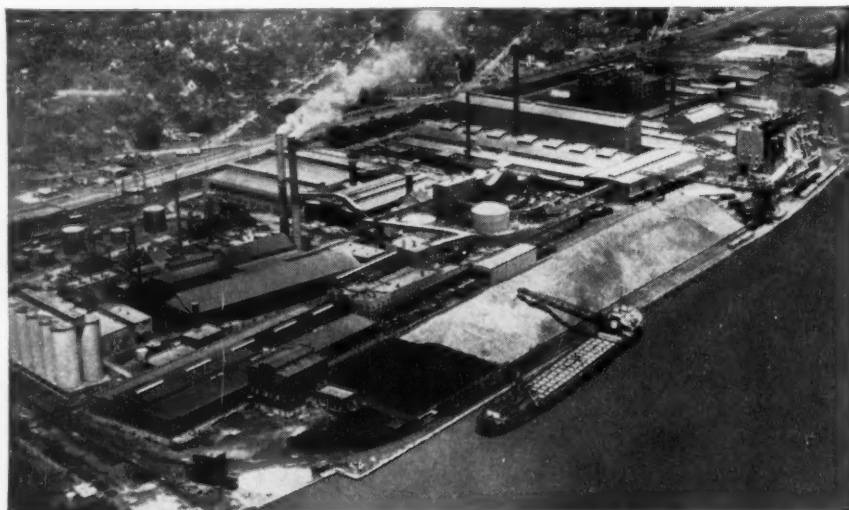
YOUR INQUIRY BRINGS complete ultrasonic technical data . . . plus authoritative 32-page Vapor Degreasing Manual. No obligation, of course.

130 Central Avenue, Clark (Rahway), New Jersey Offices in principal cities
PER-SOLV (Perchloroethylene) CIRCO-SOLV (Trichloroethylene)
Vapor and Ultrasonic Degreasers • Metal Parts Washers • Dryers • Solvent Recovery Stills



ments and it can be used in any position, even upside down. The light, rugged portable puts a load of 3000 kg. on a 10 mm. ball with intermediate loads as required. It eliminates test bars, making only one impression which is easily read. It can be used near power hammers or other places where there is vibration without affecting accuracy of tests and it is especially adapted for testing immovable parts and assembled parts in machines. In addition, the narrow and shallow nose at the anvil and the recessed base permit the user to make tests in small, cramped spaces, tubes and cylinders. An exclusive feature is the removable test head which makes

From Wyandotte . . . cleaning products that speed manufacture, cut costs




Wyandotte's South Plant in Wyandotte, Mich., covers fifty-two acres; produces scores of basic chemicals for industry. Here, and at Wyandotte's newest plant in Los Nietos, Calif., specialized products for the aircraft industry are manufactured.

	YOUR PROBLEM	ANSWER	DESCRIPTION
1	Aluminum cleaning	Altrex*	All-purpose, non-etching soak-tank cleaner; removes marking inks and soil.
2	Deoxidizing aluminum prior to spot welding	2487	Room-temperature deoxidizer; reduces contact resistance of aluminum alloys.
3	Magnesium cleaning	W.L.G.*	Heavy-duty soak cleaner for magnesium, steel, copper, and brass.
4	Removing heat-treat scale from stainless steel; brightening heat-treated aluminum	MF Acid	Replaces dangerous hydrofluoric acid; easier and safer to handle and use; less corrosive.
5	Paint-booth coating	Hedral	Protective coating. Cuts labor costs, simplifies booth upkeep. Brush or spray on.
6	Waterwash paint-booth compound	Floet†	Very small amounts required; kills zinc chromate primer, floats air-dry lacquers.
7	Electrocleaning	F.S.*	Heavy-duty electrocleaner for cleaning steel before plating. Exceptional detergency.
8	Barrel finishing	Burnek	Add to water in barrel finishing for brighter metal finishes. Removes light tarnish.
9	Floor absorbent (anti-slip)	Zorball	An all-purpose floor absorbent; makes floors skidproof, safe at lowest use-cost.

*Reg. U.S. Pat. Off. †Patent Applied For

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AIRCRAFT DEPARTMENT 2318 • Wyandotte, Michigan

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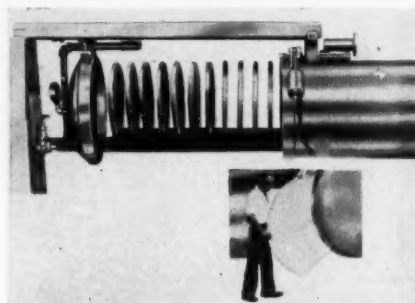
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it possible to test parts of any size, anywhere. This means that material and products that could never be tested before because of size or other limitations can now be tested accurately. The test head out of the base can be held by any means capable of withstanding the 3-ton thrust of the ram on the ball. A C-clamp, yokes and tie bars, jacks and beams are a few of the many ways this can be done.

New Features Added to Horizontal Filters

*Industrial Filter & Pump Mfg. Co.,
Dept. MF, 5900 Ogden Ave., Chicago
50, Ill.*



New features that speed up operation and simplify recovery or disposal of filter cake are now being built into the firm's horizontal filters. These include a quick opening hydraulically operated and sealed door, and filter leaves which lift out and snap back into place without bolts. An optional vibrating attachment shakes off the filter cake, eliminating the need for scraping or shaking by hand. Standard features also include power or manual withdrawal of leaf assembly, completely exposing all the leaves; bottom outlet; air drying facilities; and optional leaf spacing.

Humidity Cabinet

*Precision Scientific Company, Dept.
MF, 3737 W. Cortland St., Chicago
47, Ill.*

The Precision corrosion test humidity cabinet is used for testing the effectiveness of materials intended for the temporary protection of metals against corrosion by moisture. The cabinet produces a moisture saturated atmosphere with continuous condensation on the test specimens.

Specifically designed for tests according to National Military Establishment Specification JAN-H-792, this cabinet may also be used for other tests requiring extreme humidity at 75 to 150°F.

A revolving stage specimen rack, motor-driven at $\frac{1}{3}$ r.p.m., holds 33 test panels. A dual hydraulic thermostat regulates heat to within 2°F . The cabinet is provided with an air dispersion system and an air flow meter.

The outer wall is fir plywood, the inner wall of tinned copper. A hinged, metal-framed cloth cover prevents condensate drippage and aids even heat transmission.

Polyethylene Bottle Carriers

American Agile Corp., Dept. MF,
P. O. Box 168, Bedford, O.

Safety-type bottle carriers fabricated entirely from polyethylene are designed to protect acid- or similarly-filled glass bottles or carboys from breakage.

The unit shown is a standard model and is designed to hold a five-pint standard acid bottle. It is of welded construction with a centering ring which allows the bottle to be packed with ice or other coolant and in addition, protects the bottle from shock. Dimensions: $8\frac{1}{2}"$ O.D. in shell; $\frac{1}{4}"$ wall; $10\frac{7}{16}"$ high; with an overall height of $18\frac{1}{16}"$.

Both impact capacity of the polyethylene material and the design of the carrier afford maximum protection to the container handled. Handles are strongly attached; and the top holds the mouth of the inner bottle in a centered position, even in a pouring position.

In addition to its standard line of bottle carriers, specific units may be



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- **REDUCE WASTE DISPOSAL**
- **RECOVER RINSE WATER**
- **INCREASE PRODUCTION**
- **IMPROVE QUALITY**
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You can solve major waste disposal or water conservation problems ... and get *five extra advantages* ... with the Nalcite Ion Exchange process in your plating or anodizing plant.

Check these plus benefits in the list at left. They are important contributions to efficiency and economy in plating processes. We invite you to write, today, for full information on Nalcite Ion Exchangers.

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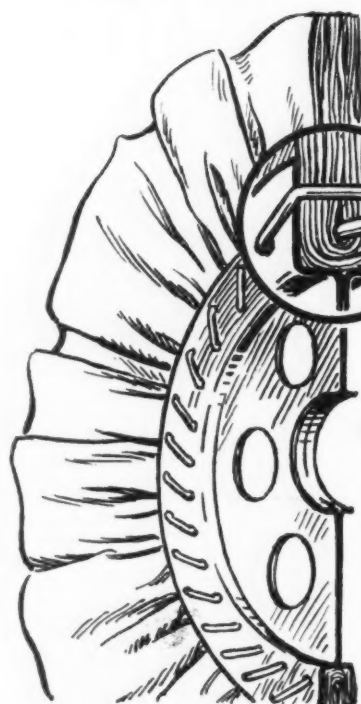
In Canada: Alchem Limited, Burlington, Ontario

Nalco®

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through Practical Applied Science**

BARKERMATIC

METAL CENTER BIAS TYPE BUFF



HIGH TENSILE
STEEL STAPLE

WELDED STEEL
RETAINING RING

STEEL PLATE ON
EACH SIDE

STRONGER BY ACTUAL TEST

Yes, up to twice as strong!

Actual tests by an independent testing laboratory proved that the Barkermatic held together under almost double the load required to pull other buffs apart.

Barkermatics in production buffing are doing jobs with safety where other buffs have ripped loose from the center.

WHY ARE BARKERMATICS STRONGER?

The Barkermatic does not rely on small teeth part way through the cloth. In the Barkermatic the cloth is secured to the center by a solid fastening that goes completely through steel plates on both sides of the cloth. This type fastening cannot bend out and release the cloth while running at high speeds. Extra protection is provided by a steel retaining ring in the center assembly. The Barkermatic *cannot* fly apart.

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PROMPT SHIPMENT ON
MAIL ORDERS.

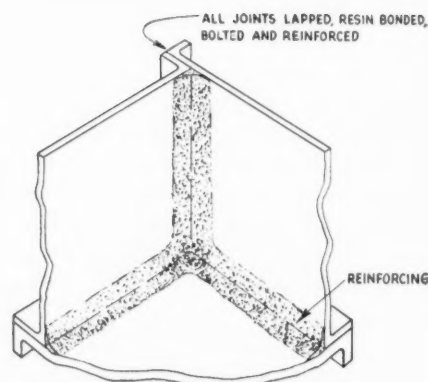
For added safety "USE BARKERMATICS"

BARKER BROTHERS INC.

ESTABLISHED 1911

1660 Summerfield Street

Brooklyn 27, N. Y.



CORNER SECTION OF MODULAR TANK

tion, which eliminates molds and special fixtures.

Acid Brick and Cement

Atlas Mineral Prods. Co., Dept. MF,
Mertztown, Pa.

The above company has announced an offer to all metal working plants employing pickling operations. The offer will give the industry an opportunity to test corrosion-proof cements in their own pickling tanks without obligation.

In brief, anyone using pickling in their metal working operations can obtain a sample briquette from the company joined with corrosion-proof cement recommended for the type pickling solution employed. The company suggests that the briquette, an hourglass shaped acid brick joined with the corrosion-proof cement, be suspended in the tank. After the desired period of time, the briquette is to be examined carefully. If the cement is to be successful in actual installation, the sample briquette must show no sign of wear or deterioration, the manufacturer claims.

ordered according to individual specifications.

Reinforced Plastic Tanks

Modular Plastics Co., Dept. MF,
1635 Westminster, Detroit 11, Mich.

A new line of low-cost, reinforced plastic tanks that are resistant to chemicals is announced by the above company. Developed especially for the plating industry, the tanks replace rubber-lined, stainless steel, vitreous ware and other more costly tanks now being used. Larger tanks lend themselves readily to this new construction method. Each tank is engineered and stress-analyzed for the particular application in which it will be used.

Polyester resins reinforced with Fiberglas are used for normal plating tank applications. Other reinforcing materials and resins have also been successfully adapted to meet special applications and conditions.

Construction features include lapped, resin-bonded, reinforced, and bolted joints that provide ample safety factor for the size of the tank. All bolts are covered with plastic to prevent corrosion. Overflow dams, outlet fittings, etc., are easily installed and present no construction problems.

The tanks are built to meet customer specifications with no premium for special sizes since both cost and delivery time are cut with the construc-

NEW BOOKS

Vapor Plating

By C. F. Powell, I. E. Campbell & B. W. Gonser. Published by John Wiley & Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 1955. Price \$5.50. 158 pages including index.

Published under the sponsorship of The Electrochemical Society, this book is a review of the applications and techniques of vapor deposition of metals and comprises the first single reference source for data on these

processes. The authors critically examine past and present methods, which are evaluated in the light of their experience with them.

In addition to a summary of the properties of many of the coatings and materials, new applications are suggested. Of the eight sections in this volume, only the introduction and the one on metals would be of interest to metal finishers but these take up half the book. The separate authors and subject indices are exceptionally complete, as are the references at the end of each section.

Metal Industry Handbook & Directory

Published by Metal Industry, Dorset House, Stamford St., London, S.E.1, England. 1955. Price 15s. 8d. Paper cover. 474 pages.

The 44th yearly edition of this famous reference book for the non-ferrous metal industries brings up to date the developments in the fields of metals and finishing, in its usually thorough manner. The comprehensive Buyers' Directory is of interest mainly to British readers but the tables and other data are always valuable. The book is available with the weekly journal *Metal Industry* at a combined price of £3.5s.0d.

BUSINESS ITEMS

William P. Drake New President of Pennsalt

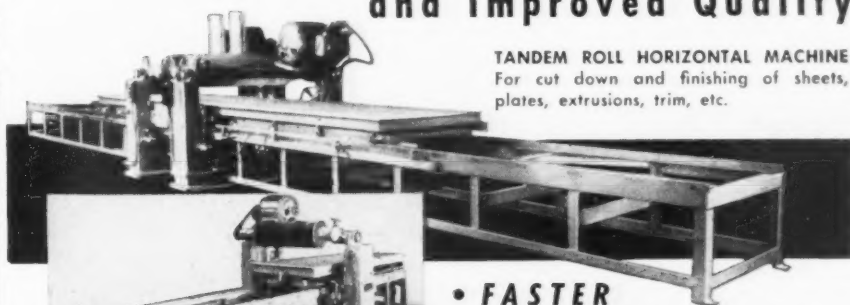
Executive vice-president William P. Drake succeeded George B. Beitzel as



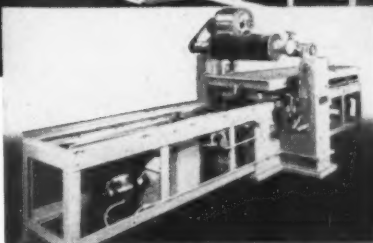
William P. Drake

CENTRAL Polishing Machines

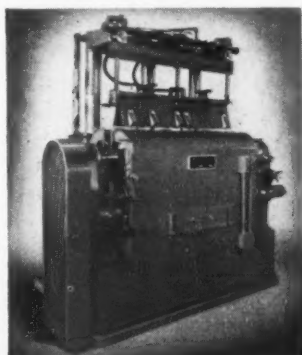
Pay Big Dividends in Time Saved and Improved Quality



TANDEM ROLL HORIZONTAL MACHINE
For cut down and finishing of sheets, plates, extrusions, trim, etc.



SINGLE ROLL HORIZONTAL MACHINE
Hydraulically operated, with patented hydraulic contour device. Tables on all machines may be oscillated sidewise.



VERTICAL POLISHING MACHINE
2 sizes, 18" and 36" stroke. Hydraulic contour device. Gives a high finish to many odd-shaped pieces.

- **FASTER**
- **MORE EFFICIENT**
- **ECONOMICAL**

For cutting costs, improving quality and speeding up your finishing operations on sheets, plates, extrusions, rods, tubing, auto trim and many odd-shaped pieces, Central Polishing Machines will meet every production require-

ment as they have done so successfully wherever they have been installed.

Horizontal Machines are built in single and tandem roll models, 30", 40" and 50" widths, in any length. Are hydraulically or electro-hydraulically operated from a central operator's station and equipped with our patented hydraulic contour control. Stroke adjusted from 2" to full capacity in stepless increments. Tandem rolls permit cut down and finishing operations with one set-up.

Vertical Machines are available with 18" or 36" stroke. They are fast, economical and easy to operate. Patented hydraulic contour device permits finishing many different shapes such as hardware items, handles, cutlery, auto and appliance trim, escutcheon plates, etc. Central Vertical Machines may be set in batteries where a sequence of operations is desired. Conveyor systems and fixtures can be furnished.

Write for full information or send us samples of work to be finished.

CENTRAL MACHINE WORKS

74 Commercial St. Tel. PL 6-1500 Worcester 8, Mass.

president of the *Pennsylvania Salt Mfg. Co.* on July 1. Mr. Beitzel will continue his association with the company as a member of its board and, in addition, will serve as chairman of the board of the *Pennsalt International Corp.*, a subsidiary. He joined the company in 1930 as a product sales manager and became its chief executive in 1949.

At 42 years of age, Mr. Drake will be the youngest president in the company's 105-year history, and with 21 years' service prior to assuming office, will have longer company experience than all but one of his thirteen predecessors.

Mr. Drake came to the firm as a summer trainee while still an under-

graduate at Bowdoin College, started as a maintenance worker at the company's Wyandotte, Mich. works and, after three years of diversified production experience, was assigned to supervisory duties in the chemical specialties department. In 1941, he became manager of this department and subsequently served as assistant vice-president and vice-president in charge of all company sales.

In 1952, he represented his industry in the Office of Price Stabilization as director of the rubber, chemicals and drugs division. When Pennsalt decentralized its operations in 1954, Mr. Drake became general manager of the company's largest operating unit, the industrial chemicals division.

SPEED UP PRODUCTION with DOUBLE-ACTION DRYING

**Air-dry as you spin-dry
with the new, improved
New Holland Model 20
KREIDER CENTRIFUGAL
DRYER**

• Now you can *spin-dry* small parts in continuous *fresh air* in as little as 15 seconds.

Double-action drying with peak-efficiency evaporation gives smooth moisture-free surfaces . . . reduces your finishing problems by eliminating the scarring frequently responsible for costly "rejects."

Your operators will be able to boost production, cut costs way down when you install New Holland's easy-to-run Model 20 Kreider Centrifugal Dryer.



SAFER because of Mechanical and Electrical Control Features!



To unlock cover and remove basket, operator must depress foot brake, stop spinner.



Machine cannot start with open cover. Ample clearance allowed for quick loading.



To start spinner, operator must first close cover completely.

SPECIFICATIONS:

1 h. p. motor—220, 440, 550 volts—2- or 3-phase—spins 75-lb. loads at 825 r.p.m. . . . Quiet V-belt drive . . . 30-blade suction turbine draws air through spinner . . . Arc-welded steel-plate construction . . . Heavy-gauge woven steel mesh basket . . . Weight: 490 lbs. . . . Floor space: Just under 5 sq. ft. . . . Meets N.E.C. specs. **Optional:** J.I.C. Control: Mounted on right, left side or wall. 160° supplementary heat: 2350-watt Chromalox, or steam.

Send for illustrated 4-page folder. Address Dept. MF-555.
New Holland Machine Company, New Holland, Pa.



NEW HOLLAND MACHINE COMPANY
NEW HOLLAND, PA.

To facilitate gradual transfer of responsibility and the projection of long-range expansion plans, Mr. Drake in February was appointed executive vice-president and elected to the board. His assumption of complete responsibility for the company's multi-plant operations follows by one week the relocation of its executive offices to Three Penn Center Plaza.

Metal & Thermit Announces New Appointments

George C. Betz has been appointed manager of sales, Chemical & Metals Dept., Metal & Thermit Corp., New York, N. Y. In his new post he will manage sales activities for the company's industrial chemicals and plating materials, ceramic products and

metals and alloys. Mr. Betz has been associated with the company since 1944 as sales manager of the ceramics department; he was previously assistant general manager of Star Porcelain Co., and prior to that assistant sales manager of Foote Minerals Co. He is a Fellow of the American Ceramic Society and, since 1930, has been a member of the executive committee. He is also a member of the New Jersey Ceramic Assn. and is a past-president of the Institute of Ceramic Engineers.

The company also has announced two new sales appointments in the Electroplating and Coatings Sales Department which now operates as its United Chromium Division.

Henry Mahlstedt has been named

manager of sales of the department. He has been connected with associated companies of Metal & Thermit since 1927 and, for the past seven years, was sales manager of the plating department of United Chromium, Inc. He attended Cooper Union Institute and received a degree in Chemical Engineering from Polytechnic Institute of Brooklyn.

Donald R. Meserve becomes assistant manager of sales of the department, assisting Mr. Mahlstedt. He has served with M & T associated companies in several capacities since 1942, most recently as sales manager of the organic coatings department of United Chromium. Mr. Meserve is a member of the National Association of Corrosion Engineers, National Paint & Varnish Association, American Management Association and Research Institute of America. He was graduated from Middlebury College in 1939 as a chemistry major.

New Assignments for Oakite Representatives

Oakite Products, Inc., manufacturers of industrial cleaning and metal treating materials, have announced the appointment and transfer of several technical service representatives.

William H. Duckworth, formerly a production foreman with General Motors, is now serving the metal industries in South Milwaukee. He replaces R. J. Baltzell, who has been transferred to the Elmira, N. Y. territory.

George F. Becker is the new representative in the metal industry in Kansas City, Mo., replacing Otto W. Jommersbach, transferred to the Brooklyn-Queens area in New York City.

Raymond Abazia, formerly a senior chemist with Wright Aero Division, and a member of the American Electroplaters' Society, is now representing Oakite among the metal industries in Newark, N. J.

H. Wilder, transferred to the Akron, Ohio, territory, has been replaced in LaCrosse, Wis., by R. P. Lind, and W. D. Hudson, transferred to Peoria from Topeka, Kan., is being replaced by D. R. Cowell.

Diamond Alkali Expands

Representing the first completely integrated facility of its kind in mid-America, a new installation for produc-

ing chromic acid was put into operation June 15 at the Painesville, Ohio Works of *Diamond Alkali Co.*, according to an announcement by *Frank W. Jarvis*, general manager of the firm's *Chromium Chemicals Division*.

Completion of this expansion project now gives this basic chemical producer two completely integrated, strategically located chromic acid plants for serving the metal-finishing industry. The company's other chromic acid plant is located at Kearny, N. J.

Because of its central location in the industrial "heart" of the midwestern region, the new plant will enable Diamond to give users of chromic acid faster deliveries and better service on shipments from Painesville. It is also expected to make possible savings in freight costs.

Westinghouse Names Henderson and Kennedy to New Posts

Bruce D. Henderson, vice-president of *Westinghouse Electric Corp.*, Pittsburgh, Pa., has been appointed to the apparatus products staff and *A. M. Kennedy, Jr.*, has been appointed general manager, purchases and traffic, succeeding Mr. Henderson. Since 1952 Mr. Kennedy has been assistant general manager of purchases.

In his new position Mr. Henderson will be primarily concerned with personnel and organization with reference to product departmentalization. Besides these staff functions, his line responsibilities will include the director systems and materials manufacturing departments.

Mr. Henderson, a native of Nashville, Tenn., was graduated from Vanderbilt University in 1937 with a bachelor of science degree in electrical engineering and, after attending the Harvard Graduate School of Business Administration, joined the company. He has served in various purchasing capacities in Lima, O., Newark, N. J., and Sharon, Pa. In May, 1950, he came to Pittsburgh as assistant to the vice-president and general purchasing agent. He was named a vice-president of the company in 1953.

A native of Sewickley, Pa., Mr. Kennedy was graduated from Yale University in 1939 and then engaged in a year of advance study at Carnegie Institute of Technology. He joined the purchasing department at the Lima, O., plant in 1941 and held purchasing positions at Newark, N. J., and Sharon,

DONE TO A TURN

...with Stanley Silicones



When Taylor's new Dial Oven Thermometer needed a coating that would stand up to high oven heat, Stanley chemists cooked up just the right silicone enamel in three bright, fast colors that bat 1,000 in the hot stove league . . . one more example of a Stanley custom finish making a good product better. Maybe your product could profit, too. Why not write us for Free literature, at 81 Berlin St., East Berlin, Conn.



S **STANLEY**
C **CHEMICAL**

LACQUERS
SYNTHETICS
VINYL
ENAMELS

Pa., before coming to Pittsburgh headquarters in 1951 as director of steel purchases for the company.

Changes at F. J. Stokes

Paul Bixler and *James Culton* have joined the headquarters staff of the *International Division of F. J. Stokes Mach. Co.*, Philadelphia, Pa.,

Mr. Bixler, who was born in Serpipe, Brazil, was educated at Philips Academy, Andover, Mass., and the University of Pennsylvania, where he majored in foreign trade and was graduated with a B.S. in economics. After several years as Latin-American representative for Armstrong Cork Company, prior to World War II, he joined the U. S. Navy, serving in the Office of Naval Intelligence and for a

year and a half as assistant naval attache in Caracas, Venezuela. He held the rank of Lieutenant Commander at the time of his discharge.

Mr. Culton, a native of Mount Lebanon, Pa., is a graduate of Washington & Jefferson College and the U. S. Merchant Marine Academy. After four years at sea, sailing all of the major trade routes, he joined Smith, Kline and French Labs, in 1949.

The company has opened a new sales office in Toronto, at 27 Wellington East, to give better service to the growing number of Stokes customers in Ontario province. *J. William Robinson*, who has been manager of the Montreal office since it was opened in April, 1953, will be in charge of the new office. *Fred Walters* has been

added to the staff as a sales engineer and will make the Toronto office his headquarters.

Mr. Walters, a Canadian citizen and a long time resident of Toronto, was graduated from McGill University in 1952 with a B.S. in mechanical engineering. Before joining Stokes, he had been, successively, a methods engineer with Northern Electric Co. Ltd., Montreal; an engineer with R. M. Way & Co., consulting mining engineers, Toronto; and a production and service engineer with Gutta Percha & Rubber, Ltd., moulders and extruders, Toronto.

Roger H. Watkins has joined the Cleveland sales staff as a senior sales engineer. A native of Belmont, Mass., he was graduated from Kent State University in 1947 with a B.S. in chemistry and mathematics. After a year's post-graduate study there, he joined Gould Storage Battery Corp. as a field engineer, serving industrial customers in the Northern Ohio area. In July, 1950, he became a sales representative for Stanley H. Smith and Co., manufacturers' agent for a number of companies supplying the railway industry, from which firm he

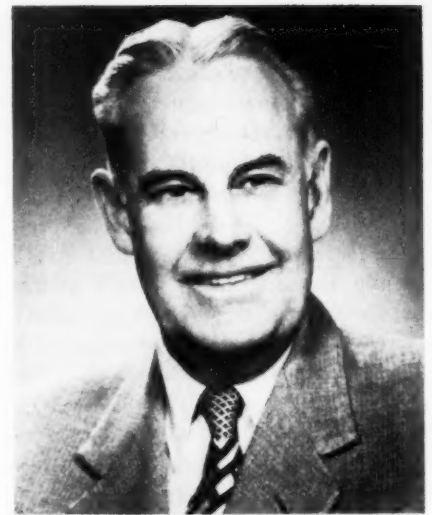
came to the Stokes organization early this year.

During the war, Mr. Watkins served three years in the U. S. Navy, as boat group officer on an attack transport in the Pacific theater. He held the rank of Lt. (j.g.) at the time of his release from active duty in July, 1946.

Tracey Named Rocky Mountain Rep. for Pioneer Industrial Gloves

Joe E. Tracey, of Denver, has been named Rocky Mountain representative for the Industrial Products Division of the Pioneer Rubber Co., makers of Stanzoil, Stanflex and Sheergrip industrial gloves.

Mr. Tracey has lived and worked in the Rocky Mountain area for over 35 years. During that time he has been active in the fields of marketing, merchandising, advertising and promotion. For ten years, immediately prior to joining Pioneer, he served as advertising manager of the Frontier Refining Co., Denver. Before that he was with National War Agencies, the Denver office of McCann-Erickson, Inc., and the Continental Oil Co. He is a past president of both the Den-



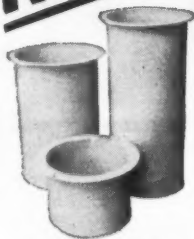
Joe E. Tracey

ver and Great Falls, Mont., Advertising Clubs.

Lee Appointed by Electric Products Co.

Gordon J. Berry, president, The Electric Products Co., Cleveland 12, Ohio, announces the appointment of W. H. Lee as manager of government sales and contracts. He will be responsible for the coordination of sales and

NOW! *Iolyte* LAMINATED FIBERGLAS* CROCKS



- PRACTICALLY UNBREAKABLE
- CHEMICALLY RESISTANT
- LIGHTWEIGHT
- INEXPENSIVE
- NOT TAPERED

*Trade mark of Owens-Corning Fibreglas Corp., Toledo, O.

Available from Stock — PRICE LIST

GAL. CAP.	OUTS. DIAM.	OUTS. HGHT.	LIST COST	GAL. CAP.	OUTS. DIAM.	OUTS. HGHT.	LIST COST
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5	10"	15"	18.00	20	18"	18"	40.00
8	12"	16"	22.00	26	18"	24"	45.00
10	12"	20"	24.00	30	18"	28"	49.00
12	12"	24"	26.00	40	18"	36"	59.00
9	10"	24"	23.00	50	18"	48"	69.00
7	9"	24"	21.00	27	22"	18"	49.00
10	16"	12"	26.00	30	22"	20"	53.00
12	16"	14"	28.00	55	22"	36"	70.00
15	16"	18"	33.00	73	22"	48"	83.00
20	16"	24"	40.00	55	28"	22"	76.00
30	16"	36"	49.00	95	28"	36"	98.00
40	16"	48"	59.00	125	28"	48"	125.00

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NICKEL
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HELP YOU



- BRIGHTER — Equal to best still tank quality
- BETTER DUCTILITY — No cracking or peeling
- SIMPLE TO USE — Temperature not critical and no carbon treatments necessary
- LOWER COSTS — 8 oz./100 gals. to start and 2 to 5 oz. addition/500 amp. hours
- NO RETURNABLE CONTAINERS — In 1 gal. jugs

WRITE FOR TECHNICAL BULLETIN ON
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TRUE BRITE CHEMICAL PRODUCTS CO.

BOX 31A, OAKVILLE, CONN.

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W. H. Lee

engineering dealing with government business.

Mr. Lee brings to his new position a broad experience in electrical engineering. A registered Professional Engineer in the states of Ohio, Florida and Tennessee, he is the holder of patents dealing with various electrical equipments. Prior to his joining the company, Mr. Lee spent four years in Oak Ridge, Tenn. as chief engineer

of Edenfield Electric, Inc., diffusion plant test engineer supervisor for the Gustav-Hirsch Organization and departmental engineer for Edenfield Electric, Inc. He also served as project engineer for the Catalytic Construction Co. In addition, before locating in Tennessee, he was associated with The Austin Co., engineers and builders, of Cleveland, Ohio, Lee and Emery, electrical contractors, Chagrin Falls, Ohio and Design Service, Cleveland. With these companies, Mr. Lee served as electrical engineer, president and chief electrical engineer.

A charter member of the Oak Ridge Post of the Society of American Military Engineers, Mr. Lee also served as chairman (Oak Ridge Section) of the AIEE and as a member of the executive council of the Instrument Society of America.

G.E. Opens New Apparatus Service Shop

A new General Electric Co. apparatus service shop was officially opened in New Orleans, La., July 1, Howard F. McCullough, general manager of the company's service shops department announced.

The shop will be located at 2809 North Robertson St., New Orleans. It will be the 45th service shop operated by the department, which is a component of the company's Apparatus Sales Division, outlet for the company's producers' goods lines.

Equipped to repair and maintain motors, transformers, control equipment, as well as to provide machine shop work, the service shop will supplement the firm's larger Atlanta, Ga., organization which formerly handled repair and maintenance responsibilities for the entire southcentral region.

E. A. Woniger, Atlanta service shop specialist, will operate the new facility under the direction of H. P. Hauck, manager of the Atlanta service shop.

Cowles Opens New Research Lab.

Platers, enamelers, and other metal-working technologists and executives joined with leaders from the chemical, food-processing, and chemical industries as guests at the open house observing Chemical Progress Week. The observance by Cowles Chemical Co. centered around its newest plant in

★ **BUFFING NU SPRA GLU**
Liquid buffing compound
since 1945

★ **NUGLU**
Cold flexible glue
since 1937

★ **BRUSHING NUGLU**
Grain and Nuglu mixture
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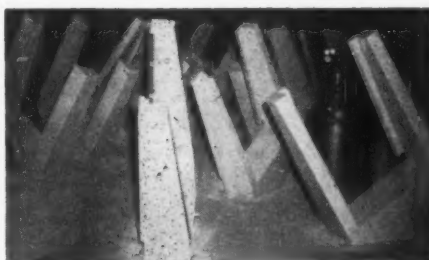
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YOU ALWAYS pay too much when you buy a poorly designed casing. Casings are a problem by themselves, because they have things going on inside that accelerate corrosion. The problems of maintenance, drainage, cleaning and inspection are well handled in details of casings designed and fabricated by Storts. We should be glad to help plan longer life for your casings.

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Manufacturers of Welded Fabrications to Specification

38 Stone Street
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Skaneateles Falls, N. Y., May 20 and 21.

Occasion for the open house was the recent opening of the new research laboratories, now housed with their office, in a new warehouse and office building annexed to the plant.

Plans for further expansion and diversification of production are already under way for the Skaneateles Falls plant, although the company will

continue to operate its older plants in Lockport, N. Y. and Sewaren, N. J.

Metal & Thermit Sales Manager Awarded Fellowship by M.I.T.

A Sloan Fellowship for a one-year executive development program has been awarded to *Harry W. Buchanan, III*, sales manager, *Chemical Div., Metal & Thermit Corp.*, by the School of Industrial Management of the

Massachusetts Institute of Technology. The Fellowship is one of twenty-nine awarded to young American executives selected to participate in the 1955-56 executive development program at M.I.T.

The fellowships are provided by a grant of funds from the Alfred P. Sloan Foundation, Inc., which also assists M.I.T. by making available funds for M.I.T.'s operation of the program.

The award of a Sloan Fellowship and the privilege of participating in the program are considered an important recognition for young executives moving toward positions of broad management responsibility.

Lea Affiliate Formed in England

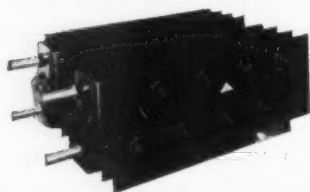
The *Lea Mfg. Co.*, Waterbury, Conn., manufacturers of compositions for surface finishing and developers of other techniques, announces the formation of an English affiliate, *Lea Mfg. Co. of England Ltd.* with offices and factory in Buxton. Although there are British interests, the English company is controlled by The Lea Mfg. Co. of Canada, Ltd., another affiliate.

BUY  **RECTIFIER**

**For the Finest in
PLATING
RECTIFIERS**

**A BETTER SOURCE OF DC POWER —
MORE FOR YOUR MONEY**

- ★ Operate from —40° to 225° F.
 - ★ 50 to 50,000 Amperes DC
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 - ★ Heavy Duty Transformers, Husky Fans
- Two styles available—1. Selenium for cool zones, or 2. Magnesium copper sulphide for the hot, dirty jobs. Units still running after 4 years of constant duty.



**Replacement Rectifier Stacks
for Lektron or Udylyte-Mallory**

Magnesium copper sulphide rectifiers make your plating power supply more rugged and dependable. Magnesium radiator fins for fast heat dissipation and lighter weight. Matching pairs.



Model 4045—750 amps at 12 volts DC—1500 amps. at 6 volts DC. Operates on 208, 220 or 440 A.C. Weight 525 lbs. F.O.B. Indianapolis, Indiana.

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WITH
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NEW**



**BUFFING
AND
POLISHING
COMPOUNDS**

You send us sample of metal used. We will return finished sample together with compound for your specific requirements. Speed up productions with correct compositions.

**HARRISON & COMPANY, INC.
HAVERHILL, MASSACHUSETTS**

Lea of England will manufacture only Lea Compound initially, although other abrasive compositions and surface finishing products will probably be manufactured later.

While permitted to sell anywhere in the world it can economically do so, the principal markets of the English-made products will be in the sterling areas.

Directors of the new company are Kergan Wells of the Canadian company, Dr. H. L. Kellner and W. D. Starr of the founder company and F. W. Anderson of Buxton, (managing director). Production is expected to start in July of this year with technical and skilled production men, trained by the parent company, on hand to help initiate production methods.

Peters-Dalton, Inc. Ups Two Executives

R. M. Richards, president of Peters-Dalton, Inc., 17900 Ryan Road, Detroit, announces two major executive appointments made necessary because of the increased activities and growth of the company.

Robert G. Callison, formerly sales



Robert G. Callison

manager, has been elected to the post of vice-president in charge of regional sales and sales promotion. Mr. Callison has been with the company for the past 18 years. Appointed to the position of general sales manager, is T. Kenneth McGuire. Previously serving as general manager of the Industrial Sheet Metal Division, Mr. McGuire has a background of 20 years in this field of industry.



T. Kenneth McGuire

The sales department has been considerably augmented and construction of a new addition to the office section of the plant is nearly completed.

Finishing Publications Welcomes Travelers

If your vacation travels bring you to the vicinity of Westwood, N. J. (Bergen County), we would be most happy to have you drop in our office

A barrel load of
bright nickel
with a nickel's
worth of

NICKELITE



CORROSION RESISTANCE UP 30% TO 100%

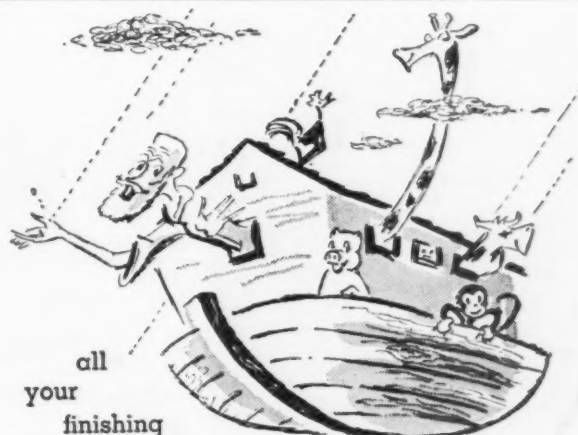
With Nickelite you can get 13 to 22 hours of salt spray exposure with 0.00006 inch of barrel nickel, instead of 11 to 13 hours. Actual salt spray tests show even greater improvement with thicker deposits. And you're saving money, too!



Concentrated to quadruple strength — you don't ship, store or handle water! Shipping weight cut 275% — no deposits, no carboy returns. Stable, efficient, easily stored, easily used — a capful of Nickelite is enough for a barrel load of nickel.

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ROOF**

J. Holland & Sons offers you the most comprehensive operation in the entire finishing industry. Because we maintain one of the world's largest in-stock supplies of polishing, plating and spray equipment; we can deliver in-stock merchandise immediately upon your request.

You can forget about the problems of buying your requirements from numerous sources. Get dependability, complete satisfaction and "one-stop" buying from under our large roof!

Our engineering and technical staff is ready to assist you in solving special problems. We'll be glad to help

J. HOLLAND & SONS, INC.

leaders in finishing equipment for over half a century
475 KEAP ST. (corner Union Ave.) BROOKLYN 11, N. Y.



for a visit with our editors and business staff. We are located in the Peoples Trust Building at the corner of Broadway and Westwood Avenue facing the park.

New Technical Field Section Opened by Inco

The International Nickel Company, Inc., announces the opening of the Southeast States Technical Field Section, Development and Research Division, with headquarters at 3179 Maple Drive, N. E., Atlanta, Ga. Embracing the States of North Carolina, South Carolina, Georgia, Florida and Alabama, the new section will furnish industry in the area with technical in-

formation and assistance relating to alloys containing nickel.

Richard J. Greene, metallurgist, is in charge of the section. He joined the company in February, 1945, as a metallurgist on the staff of the research laboratory at Bayonne, N. J. and, prior to his present appointment, was a member of the Central Atlantic Coast Technical Field Section in New York City. A graduate of Rensselaer Polytechnic Institute, Troy, N. Y., Mr. Greene holds the degree of Bachelor of Science in Metallurgical Engineering. He is a member of the American Society for Metals and the American Foundrymen's Society.

Hooker Electrochemical and Niagara Alkali Negotiating for Merger

The officers of Hooker Electrochemical Co. and of Niagara Alkali Co., both of Niagara Falls, N. Y., have announced that they are negotiating for a merger of Niagara Alkali Co. into Hooker Electrochemical Co. by the issuance of one and six-tenths of a share of Hooker common stock for each of the outstanding 600,000 shares of Niagara. Should the current negotiations result in an agreement ap-

proved by the board of directors of both companies, it is anticipated that the proposal will be submitted to the stockholders of both companies at special meetings to be held this fall.

Promotions at Diversey

W. E. Noyes, vice-president in charge of sales of The Diversey Corporation, has elevated three men to new posts created in the rapid expansion of the company's sales program.

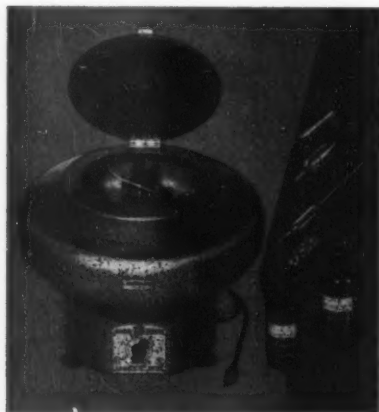
J. A. McMurtry, formerly assistant general sales manager, has been named division manager to head a newly created East Central Division. C. R. Reid has been promoted to sales manager, Food Industries and H. M. Pickles as assistant to Mr. Reid.

Manufacturers' Literature

Sisal Buff Selector

American Buff Co., Dept. MF, 2414 S. LaSalle St., Chicago 16, Ill.

A novel Sisal Buff Selector which instantly determines type of buff, size and spindle speed recommended for

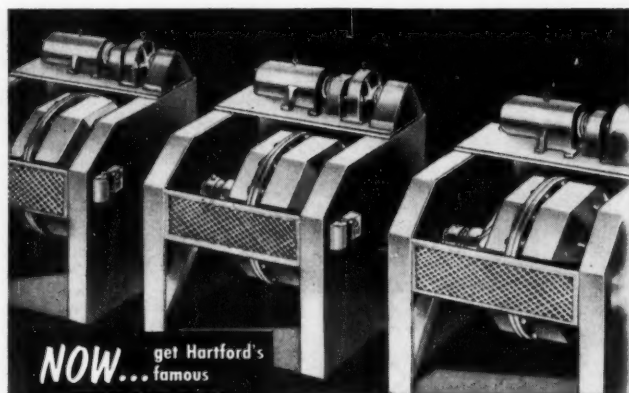


The KOCOUR SULFATE TEST SET with ELECTRIC CENTRIFUGE

... determines sulfate content in a chromium plating bath ... directions are easy to follow ... no calculations necessary ... readings are directly in ounces per gallon. Write for descriptive literature.

• KOCOUR testing sets are used all over the world for controlling plating — cleaning — pickling — anodizing — and hardening processes ... special sets can be provided for your requirements. Write today for complete information — no cost or obligation.

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Specify KOCOUR test sets from your supplier.



NOW... get Hartford's famous

TRIPLE ACTION in fully enclosed cutting barrels

There's a new look in Hartford's Tumbling Barrels...but underneath you get the famous Triple Action Barrel originated by Hartford and unsurpassed for doing a better job ... faster...at lower cost.

Compare these advantages! The Hartford fully enclosed Model 1956 is extremely compact ... requires less floor space than most enclosed barrels. With Hartford the power unit is on top, where it belongs for long life, cleanliness and ease of maintenance. Barrel is mounted on rugged "A" frame for maximum strength. Streamlined steel enclosure confines splash and contributes to safe operation. Pivoted front guard opens to permit quick, easy loading and unloading ... plus easy removal of barrel assembly. Standard power unit has four speed gear shift transmission. Literature and prices promptly furnished.



**PRECISION BALLS • RETAINERS
BEARINGS • TUMBLING BARRELS**

The Hartford Steel Ball Co., Inc., 13 Jefferson Ave., W. Hartford 6, Conn.

METAL FINISHING, August, 1955



practically every Sisal buffing job, is now available free of charge from the above company.

The selector, made up in disc form, quickly shows the recommended types of sisal buffs for many common finishing operations on automatic and semi-automatic machines, as well as hand buffing. On the back is a rapid Calculator that gives correct sizes and speeds for any job.

Simple directions printed on the selector make it easy to use. Buffs are specified for such products as cooking utensils, coffee makers, toasters, tubular furniture, grills, bumpers, and irregular surfaces. Recommendations of "preferred" sisal buffs, unit sisal, bias sisal, and open face double cloth bias

sisal are based on current usage in leading industrial finishing shops.

Bright Rhodium Plating

Sel-Rex Precious Metals, Inc., Dept. MF, 229 Main St., Belleville 9, N. J.

An illustrated 4-page technical information bulletin describing the Sel-Rex bright rhodium process, has just been completed.

The new literature contains such valuable information as bath preparation and control, operating conditions, equipment requirements, determination of rhodium in plating solution and a table listing the physical properties of rhodium.

Of special interest to readers not too familiar with electrodeposited rhodium, will be the section listing various specific industrial and decorative applications where an electrodeposit of this precious metal is producing incomparable results, economically.

Special charts have been designed as "inserts" for the booklet, which clearly indicate length of time required to electrodeposit a specified thickness of rhodium at given current densities.

Automatic Mixed Bed Demineralizers

Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y.

Technical Reprint T-137, "Treatment of Makeup Water with Automatic Mixed-Bed Demineralizer" discusses a specific eastern utility installation at which a completely automatic mixed-bed demineralizer is located. There is a discussion of the factors that led to the choice of this type of equipment, the actual system itself and the problems of starting up the plant.

There is a section devoted to the operation of the system and the results obtained. The article is illustrated with photographs of the units and panel, detailed flow sheets and results charts.

Surface Tension Testing

Pollack Products Co., Dept. MF, 1628 E. 7th St., Brooklyn 30, N. Y.

Descriptive literature, illustrating the uses of the new pocket size "Jiffy Loop" surface tension tester, which provides a quick test method for taking accurate surface tension measure-

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Metropolitan Distributors
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Improved Lucite PORTO-PLATER

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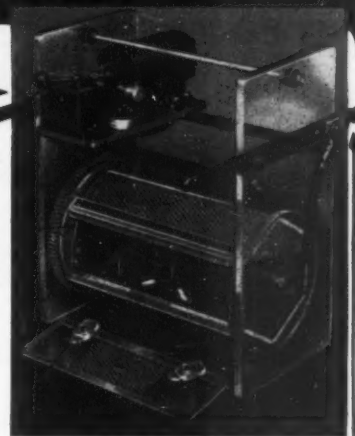
Rigid, one-piece end plates of High Temperature Lucite—support and protect mechanism and cylinder.

Self-contained motor drive with reversing switch. Positions and holds cylinder for loading and unloading.

Obstruction-free cylinder. One-piece molded High Temperature Lucite shell welded to ends. No ribs—no tie rods—no crevices.

Hangers, gears, bushings—all High Temperature Lucite.

Attached Lucite cover locks. Always in the right place—never misplaced or lost.



Notched "V" Cathode Contact—assures positive contact any place on Cathode Rod.

Continuous Processing

Through alkali cleaning, rinsing, acid treatment and plating with one loading. Temperatures to 185° F. Weight, empty, only 28 lbs., capacity, 1/4 peck. Cylinder, 9x15" O.D., 6x12" I.D.; standard perforations 3/32"—larger or smaller perforations when specified.

Ask your BELKE Service Engineer or write.



MFG. CO., 947 N. Cicero, Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

ments under production conditions, is available from the above company.

Plastic Fabrications

American Agile Corp., Dept. MF, 5461 Dunham Road, Maple Heights, O.

A 48-page general catalog, illustrating and describing the manufacturer's complete line of polyethylene and polyvinyl chloride fabricated products, plates, sheets, rods, tubes, pipes and fittings, and hot gas welding and spraying equipment is now available.

One section is devoted to charts showing chemical resistance to various reagents; more than 150 reagents are listed. Another section contains pictures and data on more than two dozen types of laboratory ware, also made of polyethylene and polyvinyl chloride, and now available from stock.

Other sections of the free literature cover self-supporting structural fabrications, details on specifying plates, sheets, rods, and the like, and operating and design features of hot gas welding and spraying equipment.

The catalog is profusely illustrated with nearly 100 photographs, engineering drawings, and sketches. Much

of the information is arranged in easy-to-read reference charts and tables.

Ultrasonic Cleaning Equipment

Acoustical Associates, Inc., Dept. MF, Shore Road, Glenwood Landing, L. I., N. Y.

The Model DR-400 ultrasonic cleaning equipment for production cleaning and degreasing, electroplating, and many other applications in metal working shops is described in a new bulletin, DR-400, just published.

A photograph of the ruggedly constructed, portable one knob control unit, an explanation of its above-audibility sound wave principle of operation, and complete specifications are presented.

Also listed in the bulletin are a number of unusual, cost saving ultrasonic applications.

Anti-Corrosion Coatings

The Atlas Mineral Prods. Co., Dept. MF, Mertztown, Pa.

A 19-page report on "Comparative Properties of Protective Coatings" by Gerald F. Gilbert, Jr., contains in-

formation on 14 types of coatings used widely to protect equipment, walls, beams and ceilings in plants where fumes and industrial atmospheres cause corrosion. Included in the report are physical and chemical data and a three-page section on the selection of coatings. A chart in the presentation shows comparative value of the various coatings as protection against weather, impact, abrasion, heat, water and various chemical groupings.

Centrifugal Wet Dust Collector

Pangborn Corp., Dept. MF, Hagerstown, Md.

Those faced with the problem of control of hot or moist, explosive or combustible, corrosive, abrasive or obnoxious dusts will be interested in the new 4-page bulletin (No. 919) describing the type "CW-1" centrifugal wet dust collector. Five photographs, three line drawings and two tables give complete data on the counter-current, wet collector of tower construction.

The action of the patented vanes in dispersing the liquid to obtain

LEA **GRIPMASTER**
Industry's Abrasive
BONDING CEMENT
for Wheels and Belts

GREATER FLEXIBILITY
— Finer Breaks

Isn't that what you want in a wheel or belt . . . a condition that permits the abrasive grains to get into crevices and go around curved surfaces? A test of Gripmaster under your working conditions will prove it superior from this angle. Send for a generous size free sample, enough to let you make a convincing competitive test.

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Filter your solutions!



50-2400 GAL/HR.
Model ASI-600 . . . Cap. 600-900 g/hr. Sethrin® Resin Filter Assembly. Stainless Centrifugal Pump. Totally Enclosed Motor . . . portable . . . Wt. 150 lbs. 2'x2'x2'

* Reg. App. For

PARTIAL LIST OF MODELS

Model	Rated Capacity	Overall Size	Weight
LSI-5	50 gal/hr	11"x14"x12"	30 lbs.
LSI-10	100 gal/hr	12"x16"x16"	40 lbs.
ASI-300	300 gal/hr	2'x2'x2'	125 lbs.
ASI-600	600 gal/hr	2'x2'x2'	150 lbs.
RLS-1200	1800 gal/hr	2'x3'x3'	300 lbs.

SERVICE . . . Filters practically any acid or alkaline solution from pH 0 to pH 14; removes particles down to one micron in size. Strainer stops metallic objects.
DESIGN . . . Filter Assembly fabricated of stainless steel 316, high temperature lucite, rubber-lined, Haveg or Sethrin® resin. Filter Tubes of cotton, dynel, porous stone or porous carbon. Pumps fabricated of Hastelloy, stainless 316 or plastic; centrifugal or self-priming. Motors drip-proof, totally enclosed, or explosion proof, 110 or 220 volt, single or three-phase, 50 or 60 cycle, sleeve or ball bearing. Hose—special acid and alkali resistant. Base—Linen Phenolic laminate on rubber tire ball bearing casters.

Sethco MANUFACTURING COMPANY
74 Willoughby Street • Brooklyn 1, New York

greater capacity in reduced space is described.

Fingerprint Remover

*E. F. Houghton & Co., Dept. MF,
303 W. Lehigh Ave., Philadelphia 33,
Pa.*

Developed to reduce rejection of metal parts caused by corrosion started from fingerprints, Cosmoline 1070 fingerprint remover is described in an illustrated 4-page bulletin recently issued.

Process Control Instruments

*Fischer & Porter Co., Dept. MF,
397 Jacksonville Road, Hatboro, Pa.*

Process control instruments standardized and stocked for immediate shipment from Hatboro, Pa.; Chicago, Ill.; Houston, Tex.; and Los Angeles, Cal., are described and illustrated in the company's new 24-page Catalog 2. Complete specifications include dimensions, prices, capacities and construction materials of master-enclosed Flowrator meters, Tri-flat low flow rate meters, all-glass flow meters, master-enclosed type flow indicators,

armored flow meters with various indicating and transmitting extensions, pneumatic recorders and controllers, flow test kits in various sizes and types, orifice type flow meters, purge meters, pressure regulators, differential pressure regulators, sight flow indicators, flow rate gauges, flow rate indicators, chemical feeders, chlorinators, miniature pneumatic indicators for graphic panels, self-operated flow regulators, and specific gravity testers. Catalog 2 also includes sizing nomographs, panel mounting diagrams, safe working pressure tables and basic operating data for the instruments described.

Dry Process Tumbling Barrels

*Tumb-L-Matic, Dept. MF, 4510
Bullard Ave., New York 70, N. Y.*

A new two-color bulletin, LS-55, describes and illustrates LS tumbling barrels for large scale, low cost finishing operations. These single-tumbler barrels employ the dry process to cut down, deburr, and polish metal, plastic, hard-rubber and wood parts.

The bulletin includes recommendations for selecting specific abrasive compounds to use in various tumbling

operations. Detailed information on barrel sizes, drives, controls, liners and optional equipment is presented.

Photographs illustrate two models of the tumbling barrels and explain overhead gear motor drives. A table of specifications gives standard model numbers, tumbler sizes and number of compartments per barrel.

Porcelain Enamel

*Armco Steel Corp., Dept. MF,
Middletown, O.*

A new 32-page booklet deals with the subject of porcelain enamel and enameling iron in a comprehensive manner.

To the prospective user it describes and illustrates 16 advantages as a modern, durable, colorful finish. A section on enameling iron covers such points as uniformity, surface, mechanical properties, and gages and sizes. There are other sections on design for porcelain enamel parts, fabrication, cleaning and pickling, good enameling practice, testing, and safe crating.

Besides many excellent photographs, the booklet contains useful tables, drawings and charts.

McKeon's Zinc-Brite

Top-quality, low-cost

ZINC SOLUTION PURIFIER

Eliminates heavy metal impurities, including copper.
Prevents harmful build-up of carbonates.

A complete cleansing treatment: — No other purification measures necessary.

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A magnetic thickness tester ...

POCKET HANDI-GAGE

FOR ELECTRODEPOSITED, HOT DIPPED
OR PAINTED COATINGS ON STEEL

Tests thicknesses from 0.0001 to 0.015 inch. Each individual gage is separately calibrated to National Bureau of Standards thickness plates, resulting in an accuracy to 10% for thicknesses over 0.0002 inch. As simple to use as an automobile tire gage, the Pocket Handi-Gage may be used on the production line or in the lab. It's perfect as a "Go, No-Go" thickness gage at the plating tank or spray booth.



NO BIGGER THAN A FOUNTAIN
PEN, BUT WHAT A JOB IT DOES!

Tests brass, cadmium, copper, lead, nickel, silver, tin, zinc, lead-tin and zinc-tin alloys, hot dipped tin and zinc, paint, plastic laminations, enamel and lacquer on steel and other magnetic metals. Gives results in SECONDS. Especially adapted for hard-to-reach areas. Comes in a pocket-sized case complete with magnets for various thickness ranges.



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N. Y.

Koroseal Tank Lining

MW Protective Coatings Div., Metalweld, Inc., Scotts Lane and Abbottsford Ave., Philadelphia 29, Pa.

A new four-page bulletin discusses, illustrates and gives considerable data on the application of flexible Koroseal sheet to plating tanks, racks, etc.

Typical service is illustrated by a tank with brick sheathing installed in 1945, which has been handling a solution of 10% nitric and 2% hydrofluoric acid at a temperature of 180°F.

Small Deaerating Heater

Graver Water Conditioning Co., Dept. MF, 216 West 14th St., New York 11, N. Y.

The above manufacturer is now offering a technical bulletin on its new, small size deaerating heater, specifically designed for use in small steam generating plants.

The bulletin describes in detail the design, operation and application of the heater.

Photographs and cross-sectional diagrams illustrate the sturdy, compact construction of the heater and the ver-

satile manner in which it can be installed. Sizing charts indicate the space requirements, capacity in lbs. per hr., amount of storage of deaerated water and the sizes of accessories furnished with the heater.

How Zinc Controls Corrosion

American Zinc Institute, Dept. MF, 60 East 42nd St., New York 17, N. Y.

"How Zinc Controls Corrosion," a new 32-page illustrated booklet describes the many ways zinc lengthens the life of steel products, and reduces maintenance costs. Drawing, charts, and photographs together with brief comments present the corrosion control characteristics of zinc coatings, zinc pigments, and zinc anodes. An extensive selection of farm, industrial, marine and building applications of zinc is reviewed.

A copy of the booklet may be obtained directly, without charge, from the Institute, which is the national trade association of the zinc industry. Its services are available without charge to anyone interested in the utilization of zinc or zinc coated products.

News from California

By Fred A. Herr



Approximately 50,000 square feet of a new 105,000 square foot building being erected and equipped at a cost of \$750,000 by the Utility Appliance Corp. of Los Angeles are devoted

to one of the most complete metal cleaning and paint finishing departments in the West.

The new building is an addition to the firm's main plant at 4851 South Alameda St., Los Angeles, in which heating, cooling and air moving equipment are manufactured. The finishing department includes all new high capacity cross draft paint spray booths, a double flow coater with quick color change attachment, and a five-stage double tunnel phosphating system.

A total of 2,500 feet of conveyor has been installed to make the entire

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ROBBED...
BY HIGH
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COSTS?

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Production
Costs 80% OR MORE

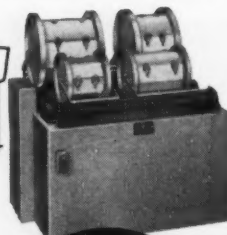
SPEED-D-BURR PRECISION BARREL FINISHING



Efficiently streamlined and designed. Offers exceptional versatility—and just exactly the right unit for any barrel finishing needs. Ideal for high production—or short runs, for large or small intricate parts. A unit for every size plant.

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Packer Machine Co. AUTOMATIC POLISHING EQUIPMENT
Grav-i-flo Corp. TUMBLING EQUIPMENT

These Are a Few of the Outstanding Lines
We Represent Exclusively on the West Coast

CHECK WITH US FOR YOUR NEEDS

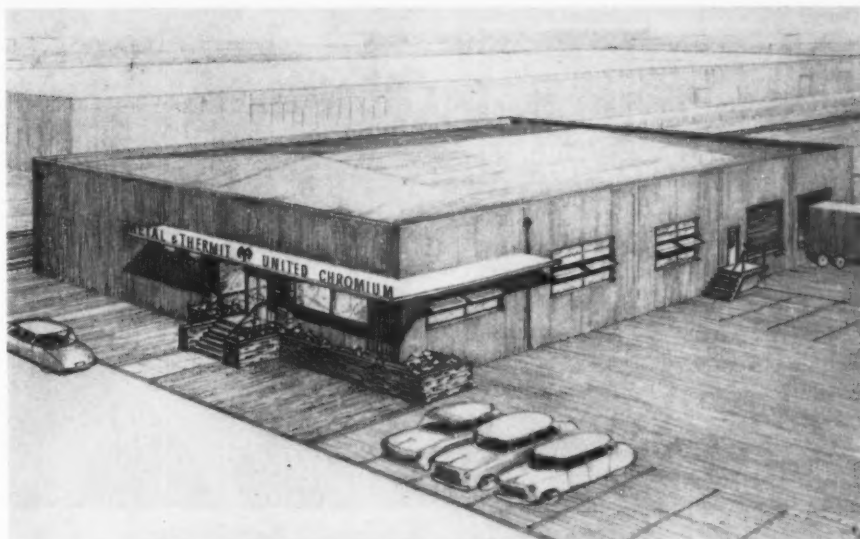
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SAN FRANCISCO SEATTLE

metal finishing process conveyorized. The system is automatic and parts need not be handled from the time they are placed on the conveyor until they are removed at the end of the process. The cleaning, phosphating, painting and baking process takes about two hours. All paint materials are stored in enclosed rooms and circulated to the spray lines and flow coater through overhead piping.

The balance of the floor area in the new building is devoted to final assembly of Utility products. Other factories operated by the company are the Gaffers & Sattler plant (gas ranges) in Los Angeles, Utility Fan Corp., Los Angeles, and Occidental Stove Co., Irvington, Cal.

Metal & Thermit Corp. has announced that it is establishing new sales headquarters for the Pacific Coast Region in the Los Angeles area. Towards the end of July the company will move its western headquarters into a new warehouse and office building now under construction at 1926 Maple Ave., El Segundo, Cal.



The new building will provide warehousing facilities for the products of all company divisions: welding materials, industrial chemicals, ceramic materials and the plating and coating materials of *United Chromium Division*.

The office space will house the Pacific Coast regional sales headquarters personnel, under the direction of *E. E. Anderson*, vice-president and general

manager for all West Coast operations.

The Los Angeles facility will be in charge of *R. E. Collins*, who will directly supervise the operation of the warehouse and will be responsible for chemical, ceramic and United Chromium Division sales. The new location will also be headquarters for welding sales personnel for the West Coast region.

The tract was acquired from the

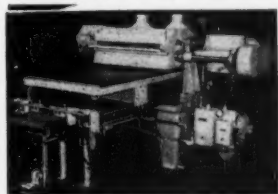
VERSATILE!

It Floats On Air!

The buffs literally ride on air . . . insuring uniform buffing pressures at any predetermined degree over flat or curved surfaces!

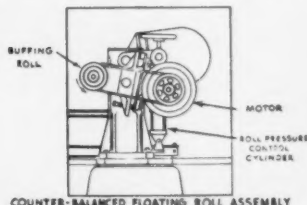
CLAIR SURFACE FINISHING MACHINES

Development of these Clair surface finishing machines is the answer to "demand-performances" from manufacturer's surface finishing departments for precision finishing machines of thorough capability and astonishing versatility.



MODEL 203 This design has anticipated the need for holding the work, with vacuum, regardless of use for surface finishing over the entire area without salvage.

- Horizontal Design offers . . .
- ★ Waist high loading . . . less operator fatigue!
- ★ Better Visibility!
- ★ Rolls can be changed in two minutes!
- ★ Easier to exhaust and keep clean!



CLAIR

MANUFACTURING CO., Inc., OLEAN, N.Y.

Offering the Most **VERSATILE** Line of Surface Finishing Machines

For ALL Your Metal Finishing Needs Depend on DAVIES

The Southwest's Leading Supplier of Industrial Plating and Polishing

- COATINGS
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Santa Fe Improvement Company, and forms part of the extensive industrial area now being developed near the Los Angeles Municipal Airport.

The building, which will contain 11,000 square feet of floor area, is of "tilt-up" concrete construction. The walls are formed from sectional slabs poured in horizontal forms, then erected into position. The facilities will include a paved parking lot, a railroad siding and ample truck loading and unloading docks for highway transport.

The Norton Company of Worcester, Mass., has appointed *Edwin R. Reed* as resident demonstrator for its Grinding Machine Division in the Los Angeles district. Reed was formerly active in a similar capacity in Chicago. He now makes his headquarters at the offices of Moore Machinery Co., 3200 S. Garfield Ave., Los Angeles.

J. B. Seage, Inc., recently moved into a new \$150,000 office, factory,



H. D. Shockley

and engineering building at 10127 Adella Ave., South Gate, Cal., in which the firm has 2½ acres of plant area with 24,000 square feet of floor space for its various production and design activities.

The new plant provides modern and diversified facilities for finishing sys-

tem design and installation in response to a trend current on the West Coast where more and more large manufacturers, who formerly jobbed out their plating and polishing, are installing metal finishing departments of their own.

Prior to 1953, the company was primarily active in the design, manufacture and installation of industrial ovens, exhaust systems, heat treating furnaces and electrical control systems. While no diminishment of those activities is contemplated, the firm has, during the past two years, gradually expanded into the metal finishing, process equipment, and plating equipment field. The new plant is equipped to permit the company to handle the design and installation of any size plating plant on the so-called "turn-key" basis. The firm is equipped to survey and evaluate existing production facilities of manufacturers for the purpose of recommending complete plant layouts.

Hugh Don Shockley is chief engi-

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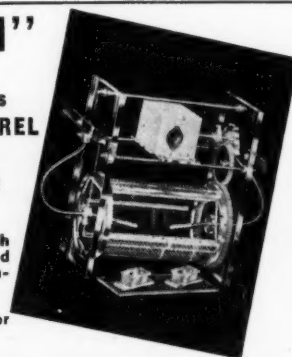
"LITTLE BUTCH"

the finest
High Temperature Plexiglas
PORTABLE PLATING BARREL

*Make your small jobs
profitable*

Inside cylinder is 6 x 12 in. with 3/32 in. perforations. Gears and side are 3/8 in. thick and will withstand temperature of 180° F.

See your own supplier or write for catalog sheet



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neer of the firm, with supervision over estimating, design, development, manufacture and installation of projects. Shockley is a graduate of Compton (Cal.) Junior College. He received his engineering training at the University of Arkansas, following which he attended the University of Southern California, graduating with a de-

gree of Bachelor of Engineering. For a year following his graduation from USC, Shockley served as a project engineer on industrial and aircraft gearing for the Western Gear Works, Lynwood, Cal. He joined the engineering staff of J. B. Seage, Inc., in 1951, and subsequently was appointed chief engineer.

The Second Western Plant Maintenance & Engineering Show was held at Pan Pacific Auditorium, Los Angeles, July 12, 13 and 14, concurrently with a series of maintenance engineering conferences, which were presented under the direction of L. C. Morrow, well known management consultant.

"Preventing and Counteracting Corrosion" by James M. Weeks of the Plomb Tool Co., Los Angeles, was one of the principal talks on a panel discussion pertaining to metal preserva-

tion in industrial plants. Discussion leader was George J. Puckett of the Dow Chemical Co., Pittsburgh, Cal.

The exhibit booths displayed every vital piece of equipment needed to insure efficient, profitable production, free of machinery breakdowns or wasteful depreciation and wear. Machinery geared to the age of automation figured strongly in the displays; such as electronic record and data evaluating machines, and ultrasonic inspection units.

Associations and Societies

AMERICAN ELECTROPLATERS' SOCIETY

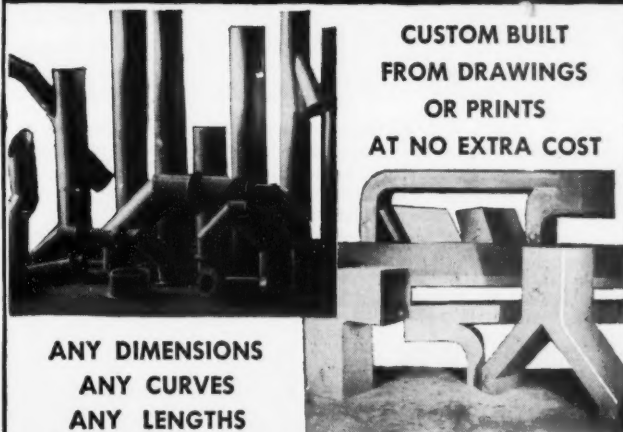
Newark Branch

The May 20th meeting of the Newark Branch opened at 8:00 p.m. with a film on automatic vending machines, after which President Tom Austin called the business meeting to order. Charles Smith and A. A. Nortof of Hanson-Van Winkle-Munning and William Ross of Bart-Messing were elected to membership and the application of Robert F. Fowler of Bart Mfg. Co. was accepted.

Dr. Dodd Carr reported a favorable response to the proposed electroplating course and announced a planning session for May 24th.

The meeting was then turned over to Librarian William Grigat who recalled Mr. Austin to the platform to discuss the "Silent Salesman." He described the present use of vending machines, some 3,000,000, as beginning many years ago with the dispens-

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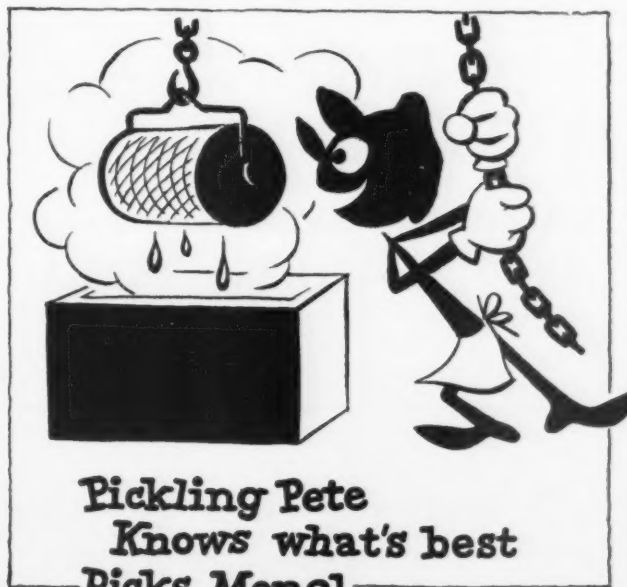
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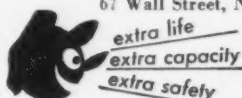
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ing of holy water and later tobacco. The broad application of this method of retailing was discussed and Mr. Austin concluded by reviewing the plating specifications followed by the manufacturers of such equipment.

Clarence Sample of the International Nickel Co. then discussed the work of Committee B-8 of the ASTM. He outlined the beginnings of this activity and pointed out the cooperation existing through the years between ASTM and AES. Presently B-8 covers all electrodeposited coatings and all base metals, limited only to joint control of specifications relating to methods of testing with Committee A-5.

The five subcommittees — specifications, performance tests, conformance tests, electroplating practices and supplementary finishes were discussed.

Nine specifications, seven (three more being drafted) recommended practices have been released and many exposure tests have been made.

The general interest of the group in this activity and AES-ASTM coop-

eration was evidenced by the many questions asked.

D. Gardner Foulke, Secretary

Los Angeles Branch

John Byouk of the General Chemical Co. was the guest speaker at the June 8 meeting of Los Angeles Branch presenting an illustrated talk on "Fluoroborate Solutions."

This last business and educational session of the branch's first-half series of meetings was attended by 85 members and guests. Mr. Byouk discussed the newer developments of fluoroborate plating, which he prefaced with a historical review of the process. Fluoroborate plating, he declared, was discovered back in the 1880's, but was not used for plating aircraft parts. The speaker outlined the chemical constituents. A number of slides, with descriptive commentary supplied by Mr. Byouk, were part of the presentation.

First Vice-President L. Truman Stoner announced that, beginning with the opening of the fall series of meetings, a determined effort will be made to bring about a continuous flow of

new members into the branch. Every effort will be made, Stoner declared, to improve on the record of the 1954-55 fiscal year when the number of resigning members was exactly balanced by the new ones, leaving the chapter with no advance over the previous year. Stoner reported that a concentrated six months membership drive will be inaugurated with the first meeting in September and continue through the March, 1956 meeting. A \$50 gift certificate will be awarded as first prize to the man bringing in the most new members; and a \$25 certificate as second prize. All members are eligible to participate except current officers and board members.

New members initiated at the June meeting were: *Ralph Humphreys*, North American Aviation, Inc., Los Angeles; *Rudolph Mastaler*, Master Plating Co., Phoenix, Ariz. (initiated by proxy); *Clare P. West*, Mefford Chemical Co., Los Angeles; and *Donald A. Steele*, California Metal Processing Co., Los Angeles.

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Harry G. Vorkink, Consolidated Engineering Co., Pasadena; John S. Beasley, Felker Manufacturing Co., Torrance; Lawrence Sherman, Modern Plating Co., Los Angeles; Clare Virginia, North American Aviation, Inc., Culver City; and Guy Wixon, Aircraft Plating Co., Hawthorne.

G. Stuart Krentel reported that the recently approved by-laws of the branch were ready for assembly into booklet form. A recommendation that the by-laws and a membership roster be combined in one booklet was referred to the board of managers for consideration.

The plating shop owners and employees who, at the branch's last basket picnic (1953), sent a team of supply house salesmen down to a one-sided defeat in a baseball game, evidently decided to rest on their laurels. Put to a vote by President Earl Arnold, the motion to hold a picnic and baseball game this summer was voted down.

Los Angeles Branch will hold no monthly meetings in July and August. The fall series of business and educational sessions will get underway on September 14.

M.E.P.A.

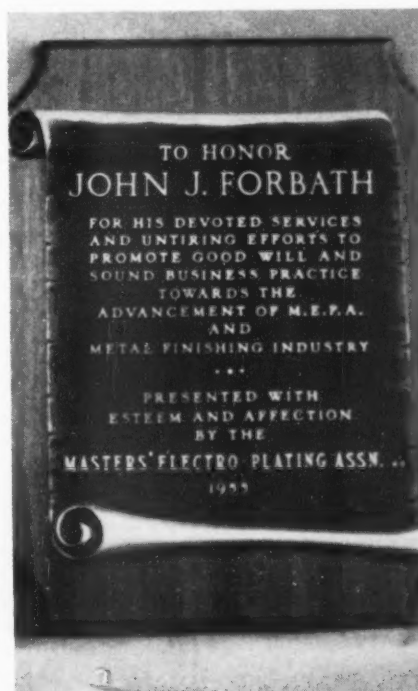
John Forbath M.E.P.A. Plating Man of the Year

On May 7th, at the 37th Annual

Banquet of the Masters' Electro-Plating Assn., John J. Forbath of Star Chromium Corp. received the Plating Man of the Year Award. On behalf of the Association, Frank Kaiser presented John with a bronze plaque. Mrs. Forbath also received a gorgeous bouquet of roses.

Altogether he has served on the executive committee of the Association for at least fifteen years.

Mr. Forbath received mechanical and electrical engineering degrees from the University of Budapest in 1918. In



the early days of his career he worked as a consultant for the Electric Bond and Share Co. and for the New York Central R. R. Co.

In 1932 he entered the plating field as manager for the Grand Chromium Corp. then situated in Long Island City. He remained with Grand Chrom-

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John Forbath



Hermann Struckhoff



Earl W. Couch

came a partner in Star Chromium Corp. also in Long Island City. The firm grew from an establishment of 5,000 square feet to the present where it occupies about 20,000 square feet of space at 43-19 37 Street, also in Long Island City. In 1951 John bought out his partner and is now sole owner of the organization.

At its meeting on June 21 at the Hotel Hollenden in Cleveland, in conjunction with the American Electroplaters' Society Convention, the Metal Finishing Suppliers' Association elevated *Hermann Struckhoff*, of Lasalco, Inc., to the presidency. He was formerly first vice-president. *Earl W. Couch*, of Lea Manufacturing Co., was elected third vice-president.

The other officers are *Joseph Duffy, Jr.*, of Pennsylvania Salt Mfg. Co., who ascended from second vice-president to first vice-president; *M. M. Beckwith*, of Harshaw Chemical Co., second vice-president (formerly third vice-president); *August P. Munning*, of Munning & Munning, secretary; and *Thomas A. Trumbour* of METAL FINISHING, treasurer.

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1—Production #101 tube polisher unit.

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Alert Supply Co. 4755 E. 49th St., Los Angeles 58, Calif.	100	Hammond Machinery Builders, Inc. 1601 Douglas Ave., Kalamazoo 54, Mich.		Packer Machine Co. Center St., Meriden, Conn.	
Allied Research Products, Inc. 4004 E. Monument St., Baltimore 5, Md.	22	Handy & Horman 82 Fulton St., New York 38, N. Y.		Pennsylvania Salt Mfg. Co. 3 Penn Center Plaza, Philadelphia 2, Pa.	68, 69
Almco Div., Queen Stove Wks. Albert Lea, Minn.		Hanson-Van Winkle-Munning Co. Matawan, N. J.	6, 76	Perma-Line Rubber Products Corp. 1755 N. Winnebago Ave., Chicago 47, Ill.	
Alsop Engineering Corp. 1008 Bright St., Milford, Conn.	74	Harrison & Co., Inc. 487 Groveland St., Haverhill, Mass.	94	Permutit Co. 330 W. 42nd St., New York 36, N. Y.	
American Brass Co. Waterbury 20, Conn.	82	Harshaw Chemical Co., The 1945 E. 97th St., Cleveland 6, Ohio	27	Pesco Plating Equipment Corp. 75 Wythe Ave., Brooklyn 11, N. Y.	108
American Buff Co. 2414 S. LaSalle St., Chicago 16, Ill.		Hartford Steel Ball Co., The Hartford 6, Conn.	96	Platers Research Corp. 59 E. 4th St., New York 3, N. Y.	95, 99
American Platinum Works 231 New Jersey R. Ave., Newark 5, N. J.	14	Haveg Corp. Newark 5, Del.		Powers Regulator Co., The 3400 Oakton St., Skokie, Ill.	35
A & P Finishing & Mfg. Co. 17760 Clarann Ave., Melvindale (Detroit), Mich.		Henderson Bros. Co. 133 S. Leonard St., Waterbury, Conn.	26	Promat Div., Poor & Co. 851 S. Market St., Waukegan, Ill.	
Apothecaries Hall Co. 22 Benedict St., Waterbury 20, Conn.		Holland & Sons, Inc., J. 475 Keap St., Brooklyn 11, N. Y.	95	Pyrosil, Inc. Cuyahoga Falls, Ohio	
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Baird Machine Co., The Stratford, Conn.	30	Illinois Water Treatment Co. 836 Cedar St., Rockford, Ill.		Ramco Manufacturing Co. 14915 Woodworth Ave., Cleveland 10, Ohio	
Baker & Co., Inc. 113 Astor St., Newark 5, N. J.		Industrial Filter & Pump Mfg. Co. 5906 Ogden Ave., Chicago 50, Ill.	37	Ransohoff, Inc. 630 N. Fifth St., Hamilton, Ohio	
Baker Co., The M. E. 25 Wheeler St., Cambridge, Mass.	107	Industrial Instruments, Inc. 89 Commerce Rd., Cedar Grove, N. J.		Rapid Electric Co. 2881 Middletown Road, Bronx 61, N. Y.	9
Barker Bros., Inc. 1660 Summerfield St., Brooklyn 27, N. Y.	88	Inflico, Inc. 912 S. Campbell Ave., Tucson, Ariz.		Richardson Allen Corp. 39-15 Main St., Flushing, N. Y.	
Bart-Messing Corp. 229 Main St., Belleville 9, N. J.	83	International Chemical Co., Inc. 2628 N. Mascher St., Philadelphia 33, Pa.	32	Roto Finish Co. 3706 Milham Rd., Kalamazoo, Mich.	
Beam Knodel Co. 195 Lafayette St., New York 12, N. Y.	97	International Nickel Company, Inc. 67 Wall St., New York 5, N. Y.	103	Rutley Industries, Inc. 415 Greenwich St., New York 13, N. Y.	
Belke Manufacturing Co. 947 N. Cicero Ave., Chicago 51, Ill.	17, 97	International Rectifier Corp. 1521 E. Grand Ave., El Segundo, Calif.		Saran Lined Pipe Co. 2415 Burdette Ave., Ferndale 20, Mich.	33
Belmont Smelting & Refining Works, Inc. 304 Belmont Ave., Brooklyn 7, N. Y.	24	International Rustproof Corp. 12507 Plover Ave., Cleveland 7, Ohio	102	Sarco Co., Inc. 350 Fifth Ave., New York 1, N. Y.	
Better Finishes & Coatings, Inc. 268 Doremus Ave., Newark 5, N. J.	80	Jelco Products 153 E. 26th St., New York 10, N. Y.		Schaffner Mfg. Co. Schaffner Center, Emsworth, Pittsburgh 2, Pa.	13
Blakeslee & Co., G. S. Chicago 50, Ill.	7	Joe-D Buff Co. Sandwich, Ill.	32	Schori Process Div., FerroCo Corp. 8-11 43rd Road, Long Island City 1, N. Y.	92, 103
Block & Co., Wesley 39-15 Main St., Flushing, N. Y.		Karr-Maize Div., Karr & Co. 923 E. Broad St., Columbus 5, Ohio		Sel Rex Precious Metals, Inc. 229 Main St., Belleville 9, N. J.	
Brucar Equipment & Supply Co. Box 433, Hempstead, L. I., N. Y.	108	Kaykor Industries 4400 Broad St., Yardville, N. J.		Sethco Mfg. Co. 78 Willoughby St., Brooklyn, N. Y.	98
Buckeye Products Co. 7033 Vine St., Cincinnati 16, Ohio		Kecour Company 4802 S. St. Louis Ave., Chicago 32, Ill.	96	Seymour Mfg. Co. 15 Franklin St., Seymour, Conn.	
California Rack Co. 4982 Firestone Blvd., South Gate, Calif.		Kosmos Electro-Finishing Research 13 Valley St., Belleville 9, N. J.		Siefen Co., J. J. 5643 Lauderdale, Detroit 9, Mich.	93
Central Machine Works 72 Commercial St., Worcester, Mass.	89	Kushner, Joseph B. Stroudsburg, Pa.	105	Simonds Abrasive Co. Philadelphia 37, Penna.	
Chandeyson Electric Co. 4074 Bingham Ave., St. Louis 16, Mo.	28, 29	Lancy Laboratory 533 Wampum Ave., Ellwood City, Pa.		Smoothex, Inc. 10705 Briggs Rd., Cleveland 11, Ohio	34
Chemical Corp., The 54 Waltham Ave., Springfield, Mass.		Land, Inc., L. J. 146-148 Grand St., New York 13, N. Y.	108	Solvay Process Div., Allied Chemical and Dye Corp. 61 Broadway, New York 6, N. Y.	
Circo Equipment Co. 130 Central Ave., Clark Twp. (Rahway), N. J.	85	Lasloco, Inc. 2818-38 Lasalle St., St. Louis 4, Mo.		Sommers Bros. Mfg. Co. 3439 No. Broadway, St. Louis 7, Mo.	105
Clair Manufacturing Co. Olean, N. Y.	101	Lea Mfg. Co. 16 Cherry Ave., Waterbury 86, Conn.	66A	Sparkler Mfg. Co. Mundelein, Ill.	11
Cleveland Process Co. 1965 East 57th St., Cleveland 3, Ohio	24	Lea-Michigan, Inc. 14066 Stansbury Ave., Detroit 27, Mich.	98	Speed-D-Burr Corp. 3613-B San Fernando Rd., Glendale 4, Calif.	100
Clinton Supply Co. 112 S. Clinton St., Chicago 6, Ill.	107	Len-Ronal, Inc. 237 E. Aurora St., Waterbury 20, Conn.	66B	Standard Plating Rack Co. 1925 N. Paulina St., Chicago 22, Ill.	
Codman Co., F. L. & J. C. 694 Plain St., Rockland, Mass.		L'Hommedieu & Sons Co., Chas. F. 4521 Ogden Ave., Chicago, Ill.	5	Stanley Chemical Co. 81 Berlin St., E. Berlin, Conn.	91
Cowles Chemical Co. 7016 Euclid Ave., Cleveland 3, Ohio		Macarr, Inc. 2458-60 Arthur Ave., Bronx 58, N. Y.		Starline Products 1717 N. Main St., Los Angeles, Calif.	102
Crown Rheostat & Supply Co. 3465 N. Kimball Ave., Chicago 18, Ill.	15	MacDermid, Incorporated Waterbury 20, Conn.	Back Cover	Stevens, Inc., Frederic B. Detroit 16, Mich.	72, 73
Davies Supply & Mfg. Co. 4160 Meramec St., St. Louis 16, Mo.	101	Magnus Chemical Co. 11 South Ave., Garwood, N. J.		Stokes Machine Co., F. J. 5500 Tabor Rd., Philadelphia 20, Pa.	16
Davis-K Products Co. 135 W. 29 St., New York, N. Y.	34	Magnuson Products, Inc. 50 Court St., Brooklyn 1, N. Y.	105	Storts Welding Co., Inc. 38 Stone St., Meriden, Conn.	93
Deming Co., The 567 Broadway, Salem, Ohio	70	Matheu Tool Works 2426B N. Clybourn, Chicago 14, Ill.		Stutz Mfg. Co., Geo. A. 4430 Carroll Ave., Chicago 24, Ill.	23
Diamond Alkali Co. 300 Union Commerce Bldg., Cleveland 14, Ohio		McGeane Chemical Co. 1040 Midland Bldg., Cleveland 15, Ohio		Sulphur Products Co., Inc. Greensburg 7, Pa.	99
Dixon Rippel, Inc. Kingston, N. Y.	104	Meaker Co., The 1635 So. 55th Ave., Chicago 50, Ill.		Swift Industrial Chemical Co. Canton, Conn.	
Dow Chemical Company, The Midland, Michigan	8, 21	Michigan Buff Co. 3503 Gaylord Ave., Detroit 12, Mich.	108	Technic, Inc. 39 Snow St., Providence, R. I.	81
Du-Lite Chemical Corp. Middletown, Conn.		Michigan Chrome & Chemical Co. 8615 Grinnell Ave., Detroit 13, Mich.	25	Ther Electric & Machine Wks. 19 S. Jefferson St., Chicago 6, Ill.	
Du Pont de Nemours & Co., E. I. Wilmington, Del.		Mido Products 1801 Border Ave., Torrance, Calif.		Thermex Co., Inc., N. J. 535 Bergen St., Harrison, N. J.	
Eaton Manufacturing Co. 755 E. 140th St., Cleveland 10, Ohio	106	Minnesota Mining & Mfg. Co. 900 Fauquier Ave., St. Paul 6, Minn.		Thermo-Panel Div., Dean Products, Inc. 1042 Dean St., Brooklyn 38, N. Y.	
Electro-Glo Co. 1430 S. Talman Ave., Chicago 8, Ill.		Mitchell Bradford Chemical Co. Wampus Lane, Milford, Conn.		True-Brite Chemical Products P. O. Box 31, Oakville, Conn.	92
Electronic Rectifiers, Inc. 2102 Spann Ave., Indianapolis 3, Ind.	94	Motor Repair & Mfg. Co., The 1555 Hamilton Ave., Cleveland 14, Ohio	107	Udylite Corp., The Detroit 11, Mich.	78, 79
Enthone, Inc. 442 Elm St., New Haven, Conn.	3	Munning & Munning, Inc. 202-208 Emmet St., Newark, N. J.		Unit Process Assemblies, Inc. 75 East 4th St., New York, N. Y.	104
Exolon Co. 945 E. Niagara, Tonawanda, N. Y.		Murray-Way Corp. P. O. Box 180, Maple Rd. E., Birmingham, Mich.		United Chromium, Inc. 100 East 42nd St., New York 17, N. Y.	10, 40
Federated Metals Div., American Smelting & Refining Co. 120 Broadway, N. Y. 5, N. Y.	71	Mutual Chemical Div., Allied Chemical & Dye Corp.	12	U. S. Galvanizing & Plating Equipment Corp. 31 Hayward St., Brooklyn, N. Y.	38
Formax Manufacturing Co. 3171 Bellevue, Detroit 7, Mich.	84	National Aluminate Corp. 6297 W. 66th Place, Chicago 38, Ill.	87	U. S. Stoneware Co. Akron 9, Ohio	75
General Electric Co. Schenectady 5, N. Y.		National Research Corp. Charlemont St., Newton Highlands 61, Mass.	20	Van Dorn Iron Works Co. 20 E. 79th St., Cleveland 4, Ohio	35
Glo-Quartz Electric Heater Co., Inc. 37934 Elm St., Willoughby, Ohio	36	National Sherardizing & Machine Co., Inc. Hartford, Conn.	105	Vanton Pump & Equipment Corp. 201 Sweetland Ave., Hillside, N. J.	
Graver Water Conditioning Co. 216 W. 14th St., New York 11, N. Y.		New Holland Machine Co. New Holland, Pa.	90	Wagner Brothers, Inc. 418 Midland, Detroit 3, Mich.	10A-D, 104
Guaranteed Buff Co., Inc. 20 Vandam St., New York 13, N. Y.	104	Niagara Alkali Co. 60 E. 42nd St., New York 17, N. Y.		Wallace & Tiernan Co., Inc. 25 Main St., Belleville 9, N. J.	
Gumm Chemical Co., Inc., Frederick 538-542 Forest St., Kearny, N. J.		Nobles Engineering & Mfg. Co. 647 East 7th St., St. Paul, Minn.		Westinghouse Electric Corp. P. O. Box 868, Pittsburgh 30, Pa.	
H & S Equipment & Sales 483 Keap St., Brooklyn 11, N. Y.	107	Northwest Chemical Co. 9310 Roselawn Ave., Detroit 4, Mich.	19	Wyandotte Chemicals Corp. Wyandotte, Mich.	31, 86
		Norton Co. 1 New Bond St., Worcester 6, Mass.		Zialite Corp. 92 Grove St., Worcester 5, Mass.	

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69
108
99
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9
33
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